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# *The* Bulletin *of the* University *of* Minnesota

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## *Announcement of*
## *Courses in Agriculture for the Year*
## *1917-1918*

*Catalog Series No. 6a*

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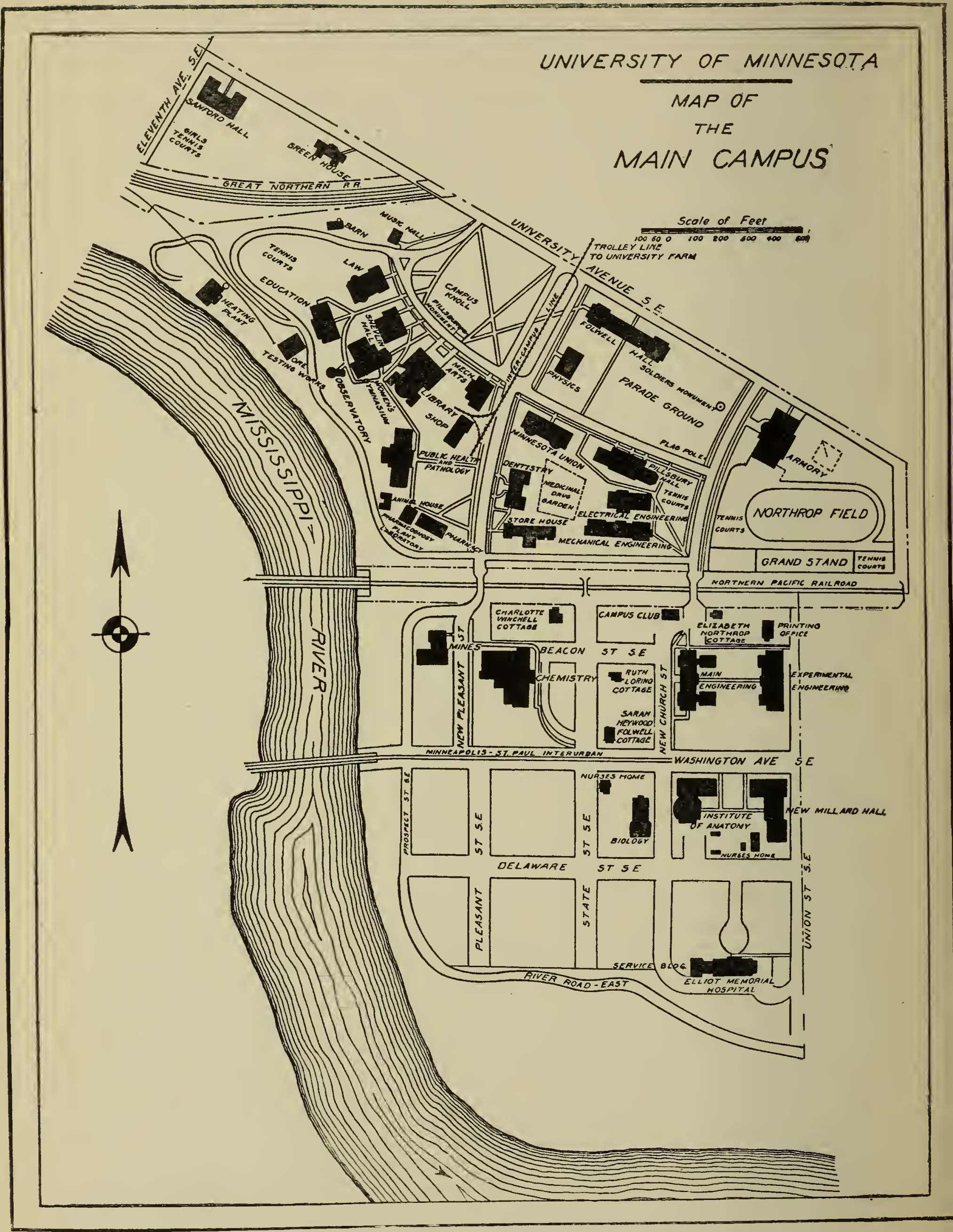
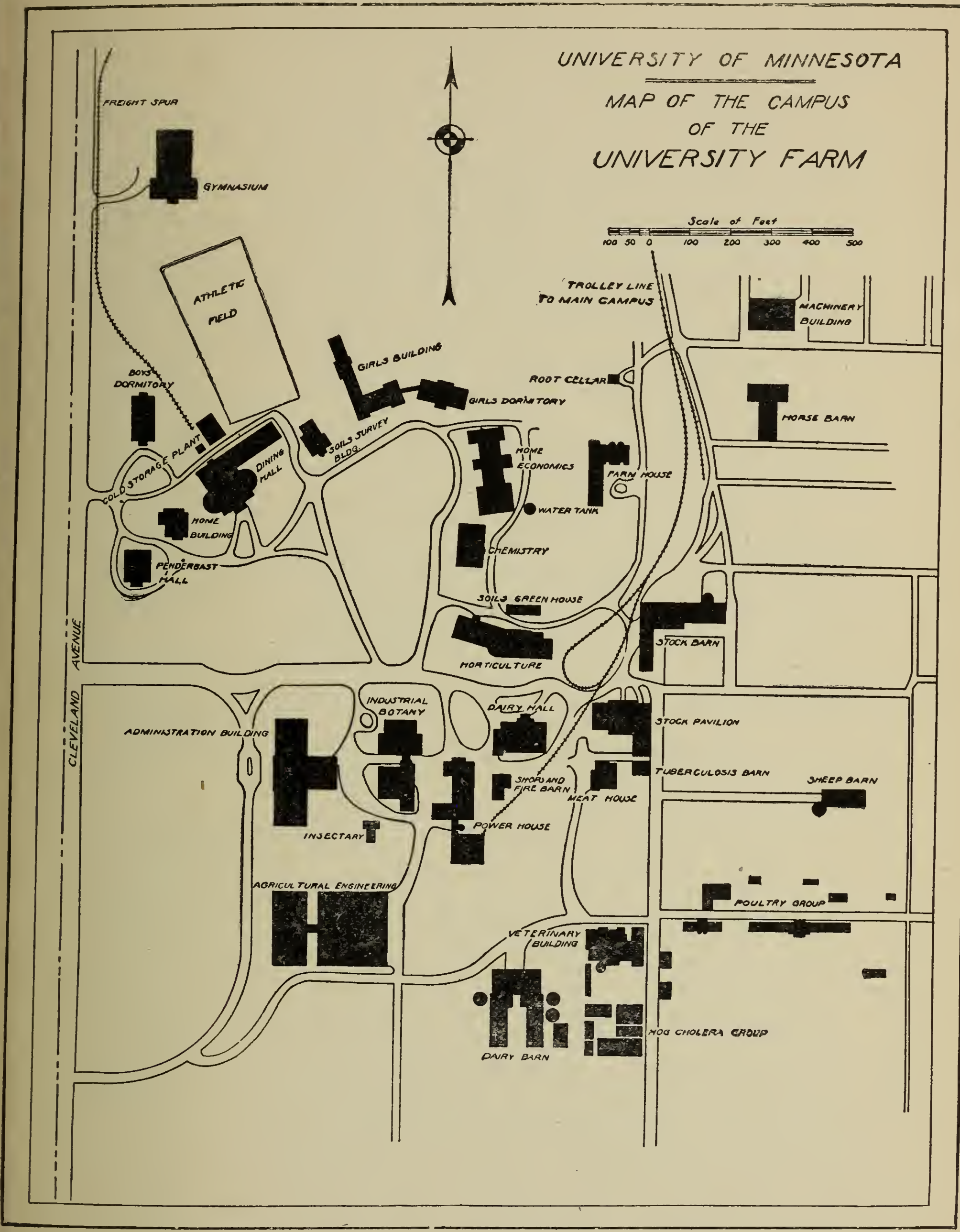
# THE COLLEGE OF AGRICULTURE

## ANNOUNCEMENT OF COURSES IN AGRICULTURE

## 1917-1918



Area of Main Campus, 108.5 acres



Area of University Farm, 422.56 acres

## 1917

### JULY

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### OCTOBER

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### NOVEMBER

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## 1918

### JANUARY

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### APRIL

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### AUGUST

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### SEPTEMBER

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### OCTOBER

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### NOVEMBER

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### DECEMBER

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| 29 | 30 | 31 | . . | . . | . . | . . |
| . . | . . | . . | . . | . . | . . | . . |

The calendars appearing on pages 4, 5, and 6 are subject to change because of war conditions. It is entirely possible that the opening of the college year may be changed to October 10 or 17, the spring recess left variable, and the closing of the college year modified accordingly.

Announcements will be made through the newspapers of the state later in the year.

# CALENDAR

## COLLEGE OF AGRICULTURE

### 1917–1918

The College year covers a period of thirty-eight weeks. Commencement Day is always the second Thursday in June.

The School of Agriculture year covers a period of twenty-four weeks beginning on the first Monday in October. Commencement Day is the last Wednesday in March.

Numerous short courses are held of from one to five weeks' duration.

| | | | |
|---|---|---|---|
| 1917 | | | |
| September | 12 | Wednesday | Registration closes except for new students |
| September | 18-25 | Week | Entrance examinations, registration of new students, and payment of fees |
| September | 26 | Wednesday | First semester begins |
| October | 1 | Monday | Agricultural College, farm experience examinations |
| October | 1 | Monday | School of Agriculture, first term begins |
| October | 12 | Friday | Half holiday. Annual freshman-sophomore contest |
| October | 18 | Thursday | Senate meeting, 4:00 p.m. |
| October | 20 | Saturday | Last day for removal of second semester incompletes |
| November | 5 | Monday | Dairy School opens |
| November | 28 | Wednesday | Thanksgiving recess begins 9:00 p.m. |
| December | 1 | Saturday | Dairy School closes |
| December | 3 | Monday | Thanksgiving recess ends 8:00 a.m. |
| December | 3-8 | Week | Second semester condition examinations |
| December | 3-8 | Week | Short course for ice-cream makers |
| December | 20 | Thursday | Senate meeting, 4:00 p.m. |
| December | 21 | Friday | Christmas vacation begins 9:00 p.m. |
| December | 21 | Friday | School of Agriculture, first term closes |
| 1918 | | | |
| December<br>January | 31<br>5 | Week | Farmers' and Home Makers' Week Short Course |
| January | 2 | Wednesday | Christmas vacation ends 8:00 a.m. |
| January | 8 | Tuesday | School of Agriculture, second term begins |
| January | 23 | Wednesday | Second semester registration closes, except for new students |
| January | 28 | Monday | Final examinations begin |

| | | | |
|---|---|---|---|
| January | 30 | Wednesday | Payment of fees for second semester closes, except for new students |
| February | 5 | Tuesday | Registration and payment of fees for second semester closes. All grades for first semester due in Secretary's Office |
| February | 6 | Wednesday | Second semester begins |
| February | 11 | Monday | Editors' Short Course begins |
| February | 12 | Tuesday | Lincoln's Birthday; a holiday |
| February | 14 | Thursday | Editors' Short Course closes |
| February | 21 | Thursday | Senate meeting, 4:00 p.m. |
| February | 22 | Friday | Washington's Birthday; a holiday |
| March | 2 | Saturday | Last day for removal of first semester incompletes |
| March | 27 | Wednesday | School of Agriculture closes |
| March | 28 | Thursday | Easter recess begins 9:00 p.m. |
| April | 1-5 | Week | Boys' and Girls' Week Short Course |
| April | 3 | Wednesday | Easter recess ends 8:00 a.m. |
| April | 8-13 | Week | First semester condition examinations |
| April | 30 | Tuesday | Traction Engineering Short Course begins |
| May | 16 | Thursday | Senate meeting, 4:00 p.m. |
| May | 30 | Thursday | Memorial Day; a holiday |
| May | 31 | Friday | Traction Engineering Short Course closes |
| June | 1 | Saturday | Final examinations begin 2:00 p.m. |
| June | 8 | Saturday | Second semester closes |
| June | 9 | Sunday | Baccalaureate service |
| June | 10 | Monday | Senior Class Day exercises |
| June | 11-18 | Week | Military Encampment, Fort Snelling |
| June | 12 | Wednesday | Alumni Day |
| June | 13 | Thursday | Forty-sixth Annual Commencement |
| June | 14 | Friday | Summer vacation begins |
| June | 17 | Monday | Summer Session and Teachers' Training School begin |
| July | 4 | Thursday | Independence Day; a holiday |
| July | 26 | Friday | Summer Session and Teachers' Training School close |
| July<br>August | 29<br>3 | Week | Rural Life Conference |

The University year for 1918-19 will begin Tuesday, September 17. Classes will begin Wednesday, September 25.

# THE COLLEGE OF AGRICULTURE

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* Term of office ends June 30, 1917.

† Term of office begins July 1, 1917.

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## FACULTY COMMITTEES

### 1917-1918

*Executive.*—Dean, Secretary, Heads of Divisions

*Enrollment.*—West, Mowry, Biester, Wentling, Bender, Pierce

*Curriculum and Catalog.*—Freeman, Boss, Storm, West, Thatcher, Berry, Gay

*Students' Work.*—Freeman, West, Berry, Cheyney, Sweeney, Ruggles

*Student Organizations.*—Lansing, Weigley, Cheyney, Weller, Freeman

*Faculty Business.*—Cheyney, Moore, Trilling, Kildee

*Appointment.*—Storm, Berry, Gehrand, Arny

*Farm Experience.*—Boss, Kildee, Brierley, Paterson

# GENERAL INFORMATION

## ADMISSION

New students are admitted at the opening of the first semester in September and the second semester in February.

All students entering for the first time must submit their credentials to the Enrollment Committee.

Admission is either by certificate or by examination. Candidates must have completed the equivalent of a four-year high school course and must present:

1. Four units of English; or three units of English and four units of a foreign language; or three units of English and two units in each of two foreign languages.
2. One unit of algebra and one unit of plane geometry.
3. Enough additional work to make in all fifteen units, of which not more than four may be in subjects not listed in the admission groups.

Graduates of the School of Agriculture of the University of Minnesota who have completed the two summers of supervised work offered in the School course, one additional School year, and one additional summer's work, or the equivalent thereof, will be admitted to the Colleges of Agriculture and Forestry.

For details of admission requirements and definition of "unit," see the Bulletin of General Information.

Every prospective student for any of the agricultural courses is urged to obtain before entering college at least six months' practical experience on a farm. Entering students whose farm experience credentials are not satisfactory will be examined as to their familiarity with farm practices, and farm experience will be required during the college course in accordance with the results of these examinations. For students specializing in Dairy Husbandry at least three of the six months of approved farm experience must be on an accredited dairy farm.

Applicants for admission are urged to present Physics (1 unit), Chemistry (1 unit), and Higher Algebra (½ unit), for entrance credits. If these subjects are not completed in the high school, they will have to be taken in the University, thus postponing some of the vocational courses.

## FEES

| | |
|---|---|
| Incidental semester fee | |
| Residents of Minnesota | $20.00 |
| Non-residents | 40.00 |
| Deposit (first semester only) | 5.00 |
| Military Deposit (freshman or sophomores, first semester in residence only) Subject to change to meet contract price of uniform | 17.90 |
| Gymnasium suit deposit | 4.25 |
| Minnesota Union (per semester) | 1.00 |

| Special fees | |
|---|---|
| Examination for removal of conditions | 1.00 |
| Examinations for credit (after the first semester in residence) | 5.00 |
| Special examinations | 5.00 |
| Change of registration | 2.50 |

*Late Registration.*—Old students must indicate their registration not later than two weeks before the day set for classes to begin. All students must complete their registration (including payment of fees) before the day set for classes to begin. Penalty for delay in either indicating or completing registration, one dollar. An additional twenty-five cents is charged for each day of delay after the last day set for the completion of registration and a similar charge for each day of delay after the last day set for payment of fees.

*Important.*—The regulations require that no student be allowed to register after the semester opens except by special committee action.

## REQUIREMENTS FOR GRADUATION AND DEGREES

After the completion of the prescribed course of study, including all of the required work and the requisite amount of elective work equivalent to a total of 144 credit hours, candidates will be recommended for graduation with the degree of Bachelor of Science. The diploma will indicate that the candidate completed the work for his degree in the College of Agriculture and his major line of work will be designated.

## PROFESSIONAL CERTIFICATES

The University State Teachers' Certificate is granted to graduates of the College of Agriculture who have completed fifteen credit hours in approved professional courses.

The Industrial Certificate, which all Minnesota high-school teachers of agriculture are required to have, is granted by the State Department of Education to graduates of the College of Agriculture who are recommended by the College and who have completed the professional training required by the regulations of the State Department of Education for special teachers in agriculture.

Students desiring this industrial certificate should consult the Chief of the Division of Agricultural Education before registering for the work of the junior year.

## FACULTY REGULATIONS

The regulations of the faculty are published in a separate booklet issued at the time of registration. Students are held responsible for compliance with all of these regulations.

# COURSES OF STUDY

Students are especially urged to read *carefully* the following general instructions and to refer to them frequently during the college course.

Six months' practical farm experience is required of each candidate for graduation unless satisfactory credentials for previous farm experience are presented. Students specializing in Dairy Husbandry must obtain at least three of this six months' experience on an accredited dairy farm.

Students are urged to decide *as early as possible* in what line of work they intend to specialize, and to consult with the faculty of the division in regard to all matters pertaining to their future work, such as electives, farm experience, and the possibilities for preparing especially for distinct fields of work. Students will be called upon to make a decision in regard to their line of specialization about the end of the freshman year. Students in doubt in regard to specialization should consult the Chairman of the Students' Work Committee or the chiefs of various divisions offering special lines.

Two groups of courses of study are offered:

1. General agricultural courses of study, in which students prepare for general agricultural pursuits, as farming, stock-raising, dairying, or teaching agriculture in secondary schools. Specialists who intend to prepare for experiment station or other research work along these lines will find it necessary to pursue graduate work. The following general agricultural courses of study are offered:

    Agricultural Education
    Agricultural Education—Manual Training
    Agronomy and Farm Management
    Animal Husbandry
    Dairy Husbandry
    Horticulture.

2. Special agricultural science courses of study, in which students prepare for special purposes, usually scientific research. In all of these courses graduate work is necessary for a thoro preparation. The following special agricultural science courses of study are offered:

    Agricultural Biochemistry
    Agricultural Economics
    Entomology and Economic Zoology
    Plant Pathology
    Soils

The freshman year and half the subjects of the sophomore year are alike in all courses. In the junior year a considerable amount of difference exists, and the senior year is almost entirely devoted to special subjects and electives. The regular amount of work is eighteen credit hours for each semester of all courses and the total amount for graduation is one hundred and forty-four credit hours. Students are requested to note carefully both (a) *the general requirements for all students* and (b) *the special requirements for the different courses of study.*

## GENERAL REQUIREMENTS FOR ALL STUDENTS IN AGRICULTURE

### EXPLANATION OF COURSE NUMBERS

Odd numbers indicate first-semester courses; even numbers, second-semester courses. A combination of the two (e.g., 5-6) indicates courses continuing through the year. In the case of courses repeated the second semester, the suffix *a* indicates first semester, the suffix *b,* second semester.

All undergraduate courses are numbered from 1 to 100. All courses open to undergraduates and graduates are numbered from 101 to 200.

Numbers following the descriptive name of a course indicate the number of credit hours.

One credit hour is equivalent to (1) one lecture or recitation period requiring two hours of preparation, (2) two periods of laboratory work requiring one hour of preparation, or (3) three periods of laboratory work with no preparation, each week for one semester.

### FRESHMAN YEAR

All students must register for group A and enough additional work from group B to make a total of not more than 18 and not less than 15 credit hours each semester. All courses in group B, except such options as are indicated, not completed in the freshman year must be registered for in the sophomore year.

### GROUP A

| *First Semester* | *Second Semester* |
|---|---|
| Bot. 1a, General Botany, 3 | Bot. Elective, 3 |
| *Rhet. 1a, Rhetoric, 3 | Rhet. 2b, Rhetoric, 3 |
| Phys. Educ. 1, Personal Hygiene | Chem. 4b, General Chemistry and Qualitative Analysis, 3 |
| Phys. Educ. 3a, Gymnasium | |
| Military Drill | Military Drill |
| †Freshman Lectures | |

### GROUP B

Agron. 7, Farm Practices. A no-credit course required of those entering with insufficient farm experience.

Agr. Eng. 1a,b, Higher Algebra, 3. Required of those who do not present higher algebra for admission.

Agr. Eng. 3a,b, Plane Trigonometry, 3. Open to those who have completed Course 1 or those who present higher algebra for admission. This course must be taken the first year.

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* Special attention is called to rules on delayed credit and for students with insufficient preparation on page 54.

† A course of lectures intended primarily to familiarize the new student with the college, college customs and methods of procedure is required of all freshmen.

Chem. 3a,b, Advanced General Chemistry and Qualitative Analysis, 3 or Chem. 33, General Chemistry and Qualitative Analysis, 5. The five credit course is offered the first semester only and must be taken by those who do not present a unit of chemistry for admission. Students may be required to change from 3 to 33 at any time during the course. Those presenting a unit of high school chemistry can obtain not more than three credits for the completion of Course 33.

Econ. 2a,b, Industries and Commerce of U. S., 3.

Hort. 90a,b, General Horticulture, 3, or Hort. Elective, 3. Hort. Elective may be taken if additional horticulture is registered for later in the course. Those intending to specialize in horticulture should register for a horticulture elective. Those intending to specialize in Agricultural Education should substitute Hort. 94 and Agr. Educ. 68, Home and School Gardening, 3, in the junior or senior year.

An. Husb. 1a,b, Types and Breeds of Livestock, 3.

Dy. Husb. 7a,b, Elements of Dairy Husbandry, 3.

Agron. 1a,b, Farm Crops I, 3.

## SPECIAL REQUIREMENTS IN THE DIFFERENT COURSES OF STUDY

### COURSE IN AGRICULTURAL BIOCHEMISTRY

### Graduate Work Advised

#### SOPHOMORE YEAR

| *First Semester* | *Second Semester* |
|---|---|
| Econ. 3a, Principles of Economics, 3 | Path. 6b, Elementary Bacteriology, 3 |
| Rhet. 11a, Argumentation, 3 | Rhet. 22b, Public Speaking, 3 |
| An. Biol. 3, General Zoology, 3 | An. Biol. 4, General Zoology, 3 |
| Chem. 35, Organic Chemistry, 4 | Chem. 36, Organic Chemistry, 4 |
| Pol. Sci. 1a, American Government, 3 | Elective, 5 |
| Elective, 2 | Military Drill |
| Military Drill | |

#### JUNIOR YEAR

| *First Semester* | *Second Semester* |
|---|---|
| Agr. Biochem. 9, Quantitative Analysis, 5 | Agr. Biochem. 10, Agricultural Quantitative Analysis, 5 |
| Phys. 1, General Physics, 3 | Phys. 2, General Physics, 3 |
| Phys. 3, General Laboratory Practice, 1 | Phys. 4, General Laboratory Practice, 1 |
| Pl. Path. and Bot. 1, Plant Pathology, 3 | Soils 4, Soil Fertility, 3 |
| Soils 3, Soil Physics and Management, 3 | Elective, 6 |
| Elective, 3 | |

#### SENIOR YEAR

| *First Semester* | *Second Semester* |
|---|---|
| Chem. 121, Physical, 2 | Chem. 122, Physical, 2 |
| Chem. 123, Physico-Chemical Laboratory, 1 | Chem. 124, Physico-Chemical Laboratory, 1 |
| Agr. Biochem. 111, Phytochemistry, 3 | Soils 108, Chemical Analysis of Soils, 3 |
| Agr. Biochem. 113, Biochemical Laboratory Methods, 2 | Electives, 12 |
| Electives, 10 | |
| Public Health Lectures | |

## COURSE IN AGRICULTURAL ECONOMICS

### Graduate Work Advised

### SOPHOMORE YEAR

Students specializing in this course will be required to take Phys. 5-6, General Physics, 6 credits, except when they present high school physics for admission or complete the equivalent of high school or college physics prior to registration for the work of the sophomore year.

| *First Semester* | *Second Semester* |
|---|---|
| Econ. 3a, Principles of Economics, 3 | Path. 6b, Elementary Bacteriology, 3 |
| Rhet. 11a, Argumentation, 3 | Rhet. 22b, Public Speaking, 3 |
| An. Biol. 3, General Zoology, 3 | An. Biol. 4, General Zoology, 3 |
| Pol. Sci. 1a, American Government, 3 | Agr. Biochem. 4, Plant and Animal Life, 3 |
| Agr. Eng. 3a, Mechanical Drawing, 3 | Elective, 3 |
| Elective, 3 | Econ. 18, Problems in Agricultural Economics, 3 |
| Military Drill | Military Drill |

### JUNIOR YEAR

| *First Semester* | *Second Semester* |
|---|---|
| Agron. 5, Farm Crops II, 3 | Agr. Eng. 10, Farm Engineering, 3 |
| Econ. 19, Marketing of Farm Products, 3 | Soils 4, Soil Fertility, 3 |
| Econ. Zool. 3, Economic Entomology, 3 | Agron. 101b, Farm Management I, 3 |
| An. Nutr. 1, Principles of Nutrition, 3 | Econ. Elective, 6 |
| Pl. Path. and Bot. 1, Plant Pathology, 3 | Elective, 3 |
| Soils 3, Soil Physics and Management, 3 | |

### SENIOR YEAR

| *First Semester* | *Second Semester* |
|---|---|
| An. Husb. 11, Elements of Feeding, 3 | Agron. 102b, Farm Management II, 3 |
| Econ. Electives, 6 | Agron. Elective, 3 |
| Electives, 9 | Econ. Elective, 3 |
| Public Health Lectures | Farm Mgt. Elective, 3 |
| | Electives, 6 |

## COURSE IN AGRICULTURAL EDUCATION

### SOPHOMORE YEAR

Students desiring to procure a state professional certificate should consult the Chief of the Division of Agricultural Education before registering for the work of the sophomore year.

Those specializing in this course will be required to take Phys. 5-6, General Physics, 6 credits, except when they present high school physics for admission or complete the equivalent of high school or college physics prior to registration for the work of the sophomore year.

| *First Semester* | *Second Semester* |
|---|---|
| Econ. 3a, Principles of Economics, 3 | Pol. Sci. 1b, American Government, 3 |
| Rhet. 11a, Argumentation, 3 | Rhet. 22b, Public Speaking, 3 |
| An. Biol. 3, General Zoology, 3 | An. Biol. 4, General Zoology, 3 |
| Path. 6a, Elementary Bacteriology, 3 | Agr. Educ. 11b, Principles of Industrial Education, 3 |
| Agr. Educ. 21, Industrial Education, 3 | Agr. Biochem. 4, Plant and Animal Life, 3 |
| An. Husb. 3, Market Classes, 3 | Agr. Eng. 3b, Mechanical Drawing, 3 |
| Military Drill | Military Drill |

### JUNIOR YEAR

By permission of Chief of Division a limited number may take Agr. Educ. 131b, Methods, in the second semester of the junior year, to prepare for Course 141a, Teaching, first semester, senior year. Those who do will postpone some 3-credit course until the second semester, senior year.

*First Semester*

Econ. Zool. 3, Economic Entomology, 3
Pl. Path. and Bot. 1, Plant Pathology, 3
Soils 3, Soil Physics and Management, 3
Agron. 5, Farm Crops II, 3
An. Nutr. 1, Principles of Nutrition, 3
An. Husb. 11, Elements of Feeding, 3

*Second Semester*

Agron. 104, Grain and Corn Judging, 3
Vet. Sci. 6, Veterinary Medicine, 3
Soils 4, Soil Fertility, 3
An. Husb. 4, Livestock Judging, 1½
Dy. Husb. 4, Dairy Stock Judging, 1½
Agr. Educ. 68 and Hort. 94, Home and School Gardening, 3
Agron. 3b, Farm Machinery, 3

### SENIOR YEAR

Agr. Educ. 141a, Teaching, is offered the first semester for as many of those, who have completed Agr. Educ. 131, Methods, as can be accommodated.

Agr. Educ. 151a,b, Organization and Management, may be taken either semester.

*First Semester*

Agr. Eng. 7, Farm Structures, 3
P. Husb. 1, Poultry, 3
Pl. Path. and Bot. 9, Weeds and Seed Testing, 3
Agr. Educ. 151a, Organization and Management, 3
Agr. Educ. 131a, Methods, 3
Elective, 3
Public Health Lectures

*Second Semester*

Agron. 102b, Farm Management II, 3
Econ. Zool. 16 and Pl. Path. and Bot. 6, Plant Pest Control, 3
Agr. Educ. 141b, Teaching, 3
Electives, 9

## COURSE IN AGRICULTURAL EDUCATION—MANUAL TRAINING

### SOPHOMORE YEAR

Students desiring to procure a state professional certificate should consult the Chief of the Agricultural Education Division before registering for the work of the sophomore year.

Those specializing in this course will be required to take Phys. 5-6, General Physics, 6 credits, except when they present high school physics for admission or complete the equivalent of high school or college physics prior to registration for the work of the sophomore year.

*First Semester*

Path. 6a, Elementary Bacteriology, 3
Econ. 3a, Principles of Economics, 3
Rhet. 11a, Argumentation, 3
An. Biol. 3, General Zoology, 3
Agr. Educ. 21, Industrial Education, 3
An. Husb. 3, Market Classes, 3
Military Drill

*Second Semester*

Pol. Sci. 1b, American Government, 3
Rhet. 22b, Public Speaking, 3
An. Biol. 4, General Zoology, 3
Agr. Biochem. 4, Plant and Animal Life, 3
Agr. Educ. 11b, Principles of Industrial Education, 3
Agr. Eng. 3b, Mechanical Drawing, 3
Military Drill

### JUNIOR YEAR

By permission of Chief of Division a limited number may take Agr. Educ. 131b, Methods, in the second semester of the junior year, to prepare for Course 141a, Teaching, first semester, senior year. Those who do will postpone some 3-credit course until the second semester, senior year.

*First Semester*

Pl. Path. and Bot. 1, Plant Pathology, 3
Econ. Zool. 3, Economic Entomology, 3
Soils 3, Soil Physics and Management, 3
Nutr. 1, Principles of Nutrition, 3
Agron. 5, Farm Crops II, 3
An. Husb. 11, Elements of Feeding, 3

*Second Semester*

Vet. Sci. 6, Veterinary Medicine, 3
Soils 4, Soil Fertility, 3
An. Husb. 4, Livestock Judging, 1½
Dy. Husb. 4, Dairy Stock Judging, 1½
Agron. 104, Grain and Corn Judging, 3
Agr. Educ. 68 and Hort. 94, Home and School Gardening, 3
Agron. 3b, Farm Machinery, 3

### SENIOR YEAR

Students majoring in this course must select their electives from the following courses: Agr. Eng. 4, Blacksmithing, 3; Agr. Eng. 16, Farm Power Machinery, 3; Advanced Drawing, 3; Advanced Wood Work, 3. At least one of the last two courses must be completed.

*First Semester*

Agr. Eng. 5, Carpentry, 3
P. Husb. 1, Poultry, 3
Agr. Eng. 7, Farm Structures, 3
Agr. Educ. 133, Administration of Manual Training, 3
Agr. Educ. 131a, Methods, 3
Agr. Educ. 151b, Organization and Management, 3
Public Health Lectures

*Second Semester*

Pol. Sci. 1b, American Government, 3
Agron. 102b, Farm Management II, 3
Econ. Zool. 16 and Pl. Path. and Bot. 6, Plant Pest Control, 3
Agr. Educ. 141b, Teaching, 3
Elective, 6

## COURSE IN AGRONOMY AND FARM MANAGEMENT

## Graduate Work Advised for Plant Breeding Specialists

### SOPHOMORE YEAR

Students specializing in this course will be required to take Phys. 5-6, General Physics, 6 credits, except when they present high school physics for admission or complete the equivalent of high school or college physics prior to registration for the work of the sophomore year.

*First Semester*

Econ. 3a, Principles of Economics, 3
Rhet. 11a, Argumentation, 3
An. Biol. 3, General Zoology, 3
Agr. Eng. 3a, Mechanical Drawing, 3
Agr. Biochem. 7, General Agricultural Biochemistry, 3
Bot. Elective, 3
Military Drill

*Second Semester*

Path. 6b, Elementary Bacteriology, 3
Rhet. 22b, Public Speaking, 3
An. Biol. 4, General Zoology, 3
Bot. Elective, 3
or
*Econ. 18, Problems in Agricultural Economics, 3
Agr. Biochem. 8, General Agricultural Biochemistry, 3
Pol. Sci. 1b, American Government, 3
Military Drill

### JUNIOR YEAR

*First Semester*

Agron. 5, Farm Crops II, 3
Econ. Zool. 3, Economic Entomology, 3
An. Nutr. 1, Principles of Nutrition, 3
Pl. Path. and Bot. 1, Plant Pathology, 3
Soils 3, Soil Physics and Management, 3
Elective, 3

*Second Semester*

Agron. 101b, Farm Management I, 3
Dy. Husb. 2, Dairy Stock Feeding and Management, 3
Vet. Sci. 6, Veterinary Medicine, 3
Soils 4, Soil Fertility, 3
Elective, 6

### SENIOR YEAR

*First Semester*

Agron. 102a, Farm Management II, 3
Agron. 103 and Hort. 109, Principles of Genetics, 3
or
*Elective, 3
Agr. Eng. 7, Farm Structures, 3
Pl. Path. and Bot. 9, Weeds and Seed Testing, 3
An. Husb. 7, Livestock Feeding and Management, 4
Elective, 2
Public Health Lectures

*Second Semester*

Agron. 108, Farm Management III, 3
Agron. 104, Grain and Corn Judging, 3
Agron. 106 and Hort. 110, Plant Breeding, 3
or
*Econ. Elective, 3
Agron. or *Farm Mgt. Elective, 3
Electives, 6

* For those specializing in Farm Management.

## COURSE IN ANIMAL HUSBANDRY

Students majoring in Animal Husbandry are advised to select at least a portion of their electives from the following list:

Dy. Husb. 2, Dairy Stock Feeding and Management, 3; Eco. Zool. 9, Animal Parasites, 3; Agron. 103 and Hort. 109, Principles of Genetics, 3; Econ. 18, Problems in Agricultural Economics, 3; Rur. and Agr. Jour. 11-12, Agricultural Journalism, 6.

### SOPHOMORE YEAR

Students specializing in this course will be required to take Phys. 5-6, General Physics, 6 credits, except when they present high school physics for admission or complete the equivalent of high school or college physics prior to registration for the work of the sophomore year.

*First Semester*

Path. 6a, Elementary Bacteriology, 3
Econ. 3a, Principles of Economics, 3
Rhet. 11a, Argumentation, 3
An. Biol. 3, General Zoology, 3
Agr. Biochem. 7, General Agricultural Biochemistry, 3
Pol. Sci. 1a, American Government, 3
Military Drill

*Second Semester*

Dy. Husb. 4, Dairy Stock Judging, 1½
Rhet. 22b, Public Speaking, 3
An. Biol. 4, General Zoology, 3
Agr. Eng. 3b, Mechanical Drawing, 3
Agr. Biochem. 8, General Agricultural Biochemistry, 3
Vet. Sci. 24, The Animal Body, 3
Elective, 1½
Military Drill

### JUNIOR YEAR

*First Semester*

An. Nutr. 1, Principles of Nutrition, 3
Vet. Sci. 27, Physiology of Domestic Animals, 3
An. Husb. 3, Market Classes of Livestock, 3

*Second Semester*

Vet. Sci. 28, Physiology of Domestic Animals, 3
Dy. Husb. 12, Dairy Cattle Feeding, 1
Soils 4, Soil Fertility, 3
An. Husb. 4, Livestock Judging, 1½

Soils 3, Soil Physics and Management, 3
Agr. Eng. 7, Farm Structures, 3
Agron. Elective, 3

Vet. Sci. 4, Livestock Breeding I, 2
*Vet. Sci. 12, Common Diseases, 3
Elective, 4½

### SENIOR YEAR

*First Semester*

P. Husb. 1, Poultry, 3
An. Husb. 7, Livestock Feeding and Management, 4
An. Husb. 9, Meats, 3
An. Husb. 5, Livestock Breeding II, 2
An. Husb. 101, Advanced Stock Judging, 3
Electives, 3
Public Health Lectures

*Second Semester*

Agron. 102b, Farm Management II, 3
Agron. Elective, 3
†Dy. and An. Husb. Elective, 6
Elective, 6

* If desired, this may be postponed until the senior year.

† At least one of the Advanced Courses 104, 106, 108, or 110 must be elected.

## COURSE IN DAIRY HUSBANDRY

*General Statement.*—Students specializing in this division are required to obtain at least three of the six months of approved farm experience required for graduation on an accredited dairy farm.

The following electives are recommended: An. Husb. 7, Livestock Feeding and Management, 4; Econ. Zool. 9, Animal Parasites, 3; Agron. 103 and Hort. 109, Principles of Genetics, 3; Econ. 18, Problems in Agricultural Economics, 3; Rur. and Agr. Jour. 11-12, Agricultural Journalism, 6; Pol. Sci. 1a,b, American Government, 3 (required for graduation).

### SOPHOMORE YEAR

Students specializing in this course will be required to take Phys. 5-6, General Physics, 6 credits, except when they present high school physics for admission or complete the equivalent of high school or college physics prior to registration for the work of the sophomore year.

*First Semester*

Econ. 3a, Principles of Economics, 3
Rhet. 11a, Argumentation, 3
An. Biol. 3, General Zoology, 3
Path. 6a, Elementary Bacteriology, 3
Dy. Husb. 11, Milk and Its Products, 3
Agr. Biochem. 7, General Agricultural Biochemistry, 3
Military Drill

*Second Semester*

Dy. Husb. 4, Dairy Stock Judging, 1½
Rhet. 22b, Public Speaking, 3
An. Biol. 4, General Zoology, 3
Agr. Eng. 3b, Mechanical Drawing, 3
Agr. Biochem. 8, General Agricultural Biochemistry, 3
Vet. Sci. 24, The Animal Body, 3
*Elective, 1½
Military Drill

### JUNIOR YEAR

*First Semester*

An. Nutr. 1, Principles of Nutrition, 3
Vet. Sci. 27, Physiology of Domestic Animals, 3
An. Husb. 3, Market Classes of Livestock, 3
Soils 3, Soil Physics and Management, 3

*Second Semester*

Dy. Husb. 2, Dairy Stock Feeding and Management, 3
Vet. Sci. 28, Physiology of Domestic Animals, 3
An. Husb. 4, Livestock Judging, 1½
Soils 4, Soil Fertility, 3

* Pol. Sci. 1a,b, American Government, 3, must be elected at some time during the course.

†Dy. Husb. 9, Cheese Making Practice, 3
or
Elective, 3
Agron. Elective, 3

Vet. Sci. 4, Livestock Breeding I, 2
‡Dy. Husb. 102, Advanced Study of Dairy Breeds, 3
or
†Dy. Husb. 10, Creamery Practice, 3
Elective, 2½

### SENIOR YEAR

*First Semester*

P. Husb. 1, Poultry, 3
An. Husb. 7, Livestock Feeding and Management, 4
An. Husb. 5, Livestock Breeding II, 2
Agr. Eng. 7, Farm Structures, 3
Dy. Husb. 101, Seminar, 2
Electives, 4
Public Health Lectures

*Second Semester*

Agron. 102b, Farm Management II, 3
Agron. Elective, 3
Agr. Biochem. 12, Dairy Chemistry, 5
Vet. Sci. 12, Common Diseases, 3
Elective, 4

† Required of those specializing in Dairy Manufactures.
‡ Required of those specializing in Dairy Production.

## COURSE IN ENTOMOLOGY AND ECONOMIC ZOOLOGY

### Graduate Work Advised

### SOPHOMORE YEAR

Students specializing in this course will be required to take Phys. 5-6, General Physics, 6 credits, except when they present high school physics for admission or complete the equivalent of high school or college physics prior to registration for the work of the sophomore year.

*First Semester*

Econ. 3a, Principles of Economics, 3
Rhet. 11a, Argumentation, 3
An. Biol. 3, General Zoology, 3
Agr. Eng. 3a, Mechanical Drawing, 3
Agr. Biochem. 7, General Agricultural Biochemistry, 3
Bot. or Econ. Zool. Elective, 3
Military Drill

*Second Semester*

Path. 6b, Elementary Bacteriology, 3
Rhet. 22b, Public Speaking, 3
An. Biol. 4, General Zoology, 3
Bot. or Econ. Zool. Elective, 3
Agr. Biochem. 8, General Agricultural Biochemistry, 3
Pol. Sci. 1b, American Government, 3
Military Drill

### JUNIOR YEAR

*First Semester*

Econ. Zool. 3, Economic Entomology, 3
Pl. Path. and Bot. 1, Plant Pathology, 3
Soils 3, Soil Physics and Management, 3
Hort. Elective, 3
Agron. Elective, 3
Elective, 3

*Second Semester*

Vet. Sci. 6, Veterinary Medicine, 3
Agr. Eng. 10, Farm Engineering, 3
Soils 4, Soil Fertility, 3
Econ. Zool. Elective, 3
Elective, 6

### SENIOR YEAR

*First Semester*

Pl. Path. and Bot. 103, Bacterial Diseases, 3
Econ. Zool. Elective, 3
Econ. Zool. or An. Biol. Elective, 3
Electives, 9
Public Health Lectures

*Second Semester*

Pl. Path. and Bot. 104, Principles of Pathology, 3
Pl. Path. and Bot. 14, Plant Disease Control, 3
Econ. Zool. Elective, 3
Econ. Zool. or An. Biol. Elective, 3
Electives, 6

## COURSE IN HORTICULTURE

Students majoring in Horticulture are required (1) to complete the following courses: 4, 32, 71, 105, 109, and 110; (2) to elect three from the following list of courses, 19, 21, 33, 34, 50, 54 and 56, 101, 107. General electives should include work in botany, plant pathology, meteorology, economic zoology, and economics.

### SOPHOMORE YEAR

Students specializing in this course will be required to take Phys. 5-6, General Physics, 6 credits, except when they present high school physics for admission or complete the equivalent of high school or college physics prior to registration for the work of the sophomore year.

| *First Semester* | *Second Semester* |
|---|---|
| Econ. 3a, Principles of Economics, 3 | Path. 6b, Elementary Bacteriology, 3 |
| Rhet. 11a, Argumentation, 3 | Rhet. 22b, Public Speaking, 3 |
| An. Biol. 3, General Zoology, 3 | An. Biol. 4, General Zoology, 3 |
| Agr. Eng. 3a, Mechanical Drawing, 3 | Agr. Biochem. 8, General Agricultural Biochemistry, 3 |
| Agr. Biochem. 7, General Agricultural Biochemistry, 3 | Pol. Sci. 1b, American Government, 3 |
| Bot. Elective, 3 | Bot. Elective, 3 |
| Military Drill | Military Drill |

### JUNIOR YEAR

| *First Semester* | *Second Semester* |
|---|---|
| Econ. Zool. 3, Economic Entomology, 3 | Econ. Zool. 18, Control of Insect Pests, 3 |
| For. 21, Farm Forestry, 3 | Pl. Path. and Bot. 14, Plant Disease Control, 3 |
| Pl. Path. and Bot. 1, Plant Pathology, 3 | Soils 4, Soil Fertility, 3 |
| Soils 3, Soil Physics and Management, 3 | Hort. Elective, 3 |
| Hort. Elective, 3 | Elective, 6 |
| Elective, 3 | |

### SENIOR YEAR

| *First Semester* | *Second Semester* |
|---|---|
| Agron. 103 and Hort. 109, Principles of Genetics, 3 | Agron. 106 and Hort. 110, Plant Breeding, 3 |
| Hort. Electives, 9 | Hort. Elective, 9 |
| Elective, 6 | Elective, 6 |
| Public Health Lectures | |

## COURSE IN PLANT PATHOLOGY

### Graduate Work Advised

### SOPHOMORE YEAR

| *First Semester* | *Second Semester* |
|---|---|
| Econ. 3a, Principles of Economics, 3 | Path. 6b, Elementary Bacteriology, 3 |
| Rhet. 11a, Argumentation, 3 | Rhet. 22b, Public Speaking, 3 |
| An. Biol. 3, General Zoology, 3 | An. Biol. 4, General Zoology, 3 |
| Agr. Biochem. 7, General Agricultural Biochemistry, 3 | Agr. Biochem. 8, General Agricultural Biochemistry, 3 |
| Bot. Elective, 3 | Bot. Elective, 3 |
| Pol. Sci. 1a, American Government, 3 | Elective, 3 |
| Military Drill | Military Drill |

### JUNIOR YEAR

| *First Semester* | *Second Semester* |
|---|---|
| †Phys. 1, General Physics, 3 | ‡Phys. 2, General Physics, 3 |
| Econ. Zool. 3, Economic Entomology, 3 | Soils 4, Soil Fertility, 3 |
| Pl. Path. and Bot. 1, Plant Pathology, 3 | Pl. Path. and Bot. 14, Plant Disease Control, 3 |
| Soils 3, Soil Physics and Management, 3 | Econ. Zool. 18, Control of Insect Pests, 3 |
| Bot. Elective, 3 | Bot. Elective, 3 |
| Elective, 3 | Electives, 3 |

### SENIOR YEAR

| *First Semester* | *Second Semester* |
|---|---|
| Pl. Path. and Bot. 103, Bacterial Diseases, 3 | Pl. Path. and Bot. 104, Principles of Pathology, 3 |
| Agr. Biochem. 111, Phytochemistry, 3 | Bot. or Econ. Zool. Elective, 3 |
| Agron. 103 and Hort. 109, Principles of Genetics, 3 | Hort. Elective, 3 |
| Bot. or Econ. Zool. Elective, 3 | Elective, 9 |
| Elective, 6 | |
| Public Health Lectures | |

† Phys. 3, General Laboratory Practice 1, should be taken at the same time.
‡ Phys. 4, General Laboratory Practice 1, should be taken at the same time.

## COURSE IN SOILS

## Graduate Work Advised

### SOPHOMORE YEAR

| *First Semester* | *Second Semester* |
|---|---|
| Econ. 3a, Principles of Economics, 3 | Path. 6b, Elementary Bacteriology, 3 |
| Rhet. 11a, Argumentation, 3 | Rhet. 22b, Public Speaking, 3 |
| An. Biol. 3, General Zoology, 3 | An. Biol. 4, General Zoology, 3 |
| Chem. 11, Quantitative Analysis, 4 | Chem. 12, Quantitative Analysis, 4 |
| Geol. 1, General, 3 | Agr. Eng. 3b, Mechanical Drawing, 3 |
| Elective, 2 | Elective, 2 |
| Military Drill | Military Drill |

### JUNIOR YEAR

| *First Semester* | *Second Semester* |
|---|---|
| Agr. Biochem. 3a, Types of Carbon Compounds, 3 | Soils 108, Chemical Analysis of Soils, 3 |
| Phys. 1, General Physics, 3 | Phys. 2, General Physics, 3 |
| Phys. 3, General Laboratory Practice, 1 | Phys. 4, General Laboratory Practice, 1 |
| Pl. Path. and Bot. 1, Plant Pathology, 3 | Agr. Eng. 10, Farm Engineering, 3 |
| Soils 3, Soil Physics and Management, 3 | Soils 4, Soil Fertility, 3 |
| Soils 107a, Mechanical Analysis of Soils, 2 | Elective, 5 |
| Pol. Sci. 1a, American Government, 3 | |

### SENIOR YEAR

| *First Semester* | *Second Semester* |
|---|---|
| Agr. Biochem. 111, Phytochemistry, 3 | Soils 102, Soil Chemistry, 5 |
| Geol. 21, Elements of Mineralogy, 3 | Agron. 102b, Farm Management II, 3 |
| Econ. Zool. 3, Economic Entomology, 3 | Electives, 10 |
| Electives, 9 | |
| Public Health Lectures | |

## ELECTIVES

The following electives are suggested, but students are not confined to these courses. Courses required in curricula other than that in which student is specializing may be selected.

These electives are open as indicated below subject to the satisfaction of the prerequisites for which see the departmental statement in each case.

### FRESHMAN YEAR

*First Semester*

Agr. Eng. 5, Carpentry, 3
Agr. Eng. 17, Advanced Blacksmithing, 3
P. Husb. 1, Poultry, 3
Econ. 2a, Industries and Commerce of U. S., 3
German, (See dept. statement)
Romance Languages, (See dept. statement)
Scandinavian, (See dept. statement)
For. 1, General Forestry, 3

*Second Semester*

Agr. Eng. 4, Blacksmithing, 3
P. Husb. 4, Incubating and Brooding, 2
P. Husb. 2, Poultry Judging, 3
Econ. 2b, Industries and Commerce of U. S., 3
German (See dept. statement)
Romance Languages, (See dept. statement)
Scandinavian, (See dept. statement)
H. E. 24, Camp Cookery, 2

### SOPHOMORE YEAR

*First Semester*

An. Husb. 3, Market Classes of Livestock, 3
Dy. Husb. 11, Milk and Its Products, 3
Hort. 71, Landscape Gardening, 3
Hort. 73, Nursery Practice, 1½
Pl. Path. and Bot. 7, Weeds and Grasses, 3
Pl. Path. and Bot. 9, Weeds and Seed Testing, 3
Rhet. 24a, Advanced Public Speaking, 3
Rhet. 25a, Fundamentals of Vocal Expression, 2
An. Biol. 7, Histology and Embryology, 3
An. Biol. 19, Comparative Gross Anatomy of Vertebrates, 3
An. Biol. 23, Entomology, 3
Bot. 5, Plant Morphology, 3
Bot. 7, Taxonomy, 3
Bot. 9, Physiology and Ecology, 3
Bot. 11, Industrial Botany, 3
Bot. 13, Mycology, 3
Chem. 35, Organic Chemistry, 4
Econ. 4a, Economic Problems, 3
Econ. 13, Economic Geography of Foreign Countries, 3
Rur. and Agr. Jour. 1, Rural Press and Rural Life, 1
Econ. 35, Accounting Principles, 3
Econ. 43a, Banking, 3
Geol. 1, General Geology, 3
Geol. 3, Laboratory, 1
Geol. 5, Economic Geology, 3
Geol. 21, Elements of Mineralogy, 3
Geol. 29, General Physiography, 3

*Second Semester*

An. Hub. 4, Livestock Judging, 1½
An. Hub. 6, Horse Power, 1
Dy. Husb. 4, Dairy Stock Judging, 1½
Hort. 4, Commercial Fruit Growing, 4
Hort. 21b, Small Fruits and Viticulture, 3
Hort. 32, Market Gardening, 3
Hort. 50, Floriculture, 3
Hort. 56, Plant Propagation, 1
Rhet. 24b, Advanced Public Speaking, 3
Rhet. 25b, Fundamentals of Vocal Expression, 3
Vet. Sci. 24, The Animal Body, 3
An. Biol. 8, Histology and Embryology, 3
An. Biol. 20, Comparative Gross Anatomy of Vertebrates, 3
An. Biol. 24, Entomology, 3
An. Biol. 28, Ornithology, 3
Bot. 6, Plant Morphology, 3
Bot. 8, Taxonomy, 3
Bot. 10, Physiology and Ecology, 3
Bot. 12, Industrial Botany, 3
Bot. 14, Mycology, 3
Chem. 36, Organic Chemistry, 4
Econ. 4b, Economic Problems, 3
Econ. 18, Problems in Agricultural Economics, 3
Econ. 34, Business Management, 3
Rur. and Agr. Jour. 2, Reporting, 3
Econ. 36, Accounting Principles, 3
Econ. 43b, Banking, 3
Econ. 46, Property Insurance, 3
Geol. 4, Geology of Minnesota, 3

Geol. 35, Laboratory, 1
Phil. 1, General Psychology, 3
Pol. Sci. 5, European Municipal Administration, 3
Pol. Sci. 7a, State and Local Government, 3

Phil. 2, General Psychology, 3
Pol. Sci. 6, American Municipal Administration, 3
Pol. Sci. 7b, State and Local Government, 3

### JUNIOR AND SENIOR YEARS

Electives for the junior and senior years will be found under Description of Courses. See also Bulletin of the College of Agriculture, Home Economics Courses and bulletins of other colleges of the University.

Elective studies may be chosen from the work offered in any of the schools or colleges of the University, except that the selection shall be subject to the rules of the school or college concerned and to such other restrictions as may be imposed by the Students' Work Committee.

# DESCRIPTION OF COURSES

For explanation of course numbers and credits see page 20.

## AGRICULTURAL BIOCHEMISTRY

Professor Roscoe W. Thatcher; Associate Professor Ross Aiken Gortner; Assistant Professors Clyde H. Bailey, John J. Willaman; Instructor Cornelia Kennedy.

*General statement.*—This Division offers two types of work, namely, courses in those phases of chemistry which have special application in agriculture or home economics for students whose major work is in other divisions; and courses designed to train chemists for research or instruction in the special field of Agricultural Biochemistry. For specialization in this Division, see special requirements in Course of Study.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 3a,b. | Types of Carbon Compounds | 3 | Soph., jr. | Chem. 1 yr. |
| 4. | Chem. of Plant and An. Life | 3 | Soph. | Chem. 1 yr. |
| 7-8. | General Agricultural Biochemistry | 6 | Soph., jr., sr. | Chem. 1 yr. |
| 9. | Quantitative Analysis | 5 | Jr., sr. | Chem. 2 yrs. |
| 10. | Agr. Quant. Analysis | 5 | Jr., sr. | 9 |
| 12. | Dairy Chemistry | 5 | Jr., sr. | 7-8 |
| | *Advanced Courses* | | | |
| 105. | Detection of Adulteration | 5 | Sr. | 10 |
| 106. | Agr. Products and By-Products | 3 | Sr. | 10 |
| 108. | Chem. of Wheat and Its Products | 2 | Sr. | 3 |
| 110. | Flour Laboratory Methods | 3 | Sr. | 10; parallel 108 |
| 111. | Phytochemistry | 3 | Sr. | Biol. 2 yrs., Org. Chem. |
| 113. | Biochemical Lab. Methods | 2 | Sr. | 10; Biol. 2 yrs., Org. Chem. |
| 114. | Laboratory Problems | 3 or 5 | Sr. | 111, 113 |

### INTRODUCTORY COURSES

3a,b. Types of Carbon Compounds. An elementary study of the different groups of carbon compounds, with special reference to their relationships and their occurrence in plant and animal materials used as food. Thatcher, Kennedy.

4. The Chemistry of Plant and Animal Life. The organic compounds commonly found in plant and animal tissues. The chemical changes during growth, harvesting, storage, and preparation for market. Factors affecting composition and changes therein. Utilization of farm by-products. Willaman.

7-8. General Agricultural Biochemistry. A qualitative and quantitative study of the types of organic compounds found in plants and animals, and of the chemical changes which occur during the growth and utilization of plant and animal products. WILLAMAN.

9. QUANTITATIVE ANALYSIS. The principles involved in gravimetric and volumetric analyses. The course includes the gravimetric determination of iron, sulphur, phosphorus, magnesium, and chlorine; acidimetry, alkalimetry; the volumetric determination of iron and calcium; and iodimetry. WILLAMAN.

10. AGRICULTURAL QUANTITATIVE ANALYSIS. Methods of proximate analysis of agricultural products, including the determination of moisture, ash, fats, starch, sugars, fiber, proteins, and the different nitrogenous constituents of foods and feeding stuffs. WILLAMAN.

12. DAIRY CHEMISTRY. The chemistry of milk and its products. Preliminary practice in quantitative methods followed by laboratory work in the analysis of milk, butter, and cheese, and the detection of adulterants in them. WILLAMAN.

## ADVANCED COURSES

105. DETECTION OF ADULTERANTS OF FOODS AND FEEDING STUFFS. The use of proximate analyses and special tests for the determination of quality and the detection of adulteration of foods and feeds. Includes chemical and microscopical examinations. WILLAMAN.

106. AGRICULTURAL PRODUCTS AND BY-PRODUCTS. The composition of the principal products and by-products of agriculture and their utilization as raw material in various industries, and the methods of chemical control work in these industries. BAILEY.

108. CHEMISTRY OF WHEAT AND WHEAT PRODUCTS. A lecture course, with collateral library reference work, on the chemical technology of the production and milling of wheat and the conversion of its products into human food. BAILEY.

110. FLOUR LABORATORY METHODS. A laboratory course in the methods of analyses of wheat and its products; milling tests of wheat; and baking and special tests of flour. BAILEY.

111. PHYTOCHEMISTRY. An advanced course in the chemistry of fats, carbohydrates, tannins, proteins, enzymes, and colloids and their relation to the vital processes involved in plant and animal growth and nutrition. THATCHER.

113. BIOCHEMICAL LABORATORY METHODS. Special methods of examination of plant and animal tissues for particular fats, carbohydrates, proteins, and enzymes. KENNEDY.

114. LABORATORY PROBLEMS IN BIOCHEMISTRY. Special laboratory work in the preparation and isolation of pure compounds which occur in living

cells, in the study of biochemical reactions, and in special methods of identification or determination of biochemical products. GORTNER.

## AGRICULTURAL ECONOMICS

See Department of Economics (page 64).

## AGRICULTURAL EDUCATION

Professors ASHLEY V. STORM, DEXTER D. MAYNE; Associate Professor WILBUR H. BENDER; Assistant Professor WILLIAM F. LUSK; Extension Specialists THEODORE A. ERICKSON, GEORGE F. HOWARD.

*General statement.*—For specialization in this department, see special requirements in Course of Study.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| *11a,b. | Principles of Industrial Education | 3 | Soph., jr., sr. | None |
| *21. | Industrial Education | 3 | Soph., jr., sr. | None |
| 63. | General Agriculture | 3 | All | None |
| 64. | General Agriculture | 3 | All | None |
| 68. | Home and School Gardening | 3 | Jr., sr. | None |
| | *Advanced Courses* | | | |
| *131a,b. | Methods in Teaching High School Agriculture | 3 | Sr. | 11 |
| *141a,b. | Teaching | 3 | Sr. | 131, Agron. 5, 104, See statement |
| *151a,b. | Organization and Management | 3 | Sr. | 68 |
| 161. | Fundamentals of Agriculture | 3 | Jr., sr. | None |
| 162. | Fundamentals of Agriculture | 3 | Jr., sr. | None |
| 171. | Extension Work | 3 | Sr. | None |

* College of Education.

### INTRODUCTORY COURSES

11a,b. PRINCIPLES OF INDUSTRIAL EDUCATION. The fundamental principles upon which education is based. Emphasis is placed on those phases which are most closely related to industrial education. LUSK.

21. INDUSTRIAL EDUCATION. A short history of industrial education; the present status in Europe and United States; manual training and home arts in an educational system; the place of agriculture in the public schools; trade and vocational schools. MAYNE.

63. GENERAL AGRICULTURE. For students specializing in such divisions as Agricultural Biochemistry, Economic Zoology, Plant Pathology, and in other colleges. A series of units by division chiefs and other agricultural specialists. Not offered in 1917-18. STORM, MAYNE.

64. GENERAL AGRICULTURE. Continuation of Course 63. Credit is given for either course separately but there is no duplication of subject

matter and both should be taken to obtain a general knowledge of agriculture. Not offered in 1917-18. STORM, MAYNE.

68. HOME AND SCHOOL GARDENING. Lectures and laboratory. The elements of horticulture as applied to high-school instruction, plant propagation, fruit growing, home gardening, school gardening, and the planning of home and school grounds. Same as Hort. 94. LUSK, BRIERLEY.

### ADVANCED COURSES

131a,b. METHODS IN TEACHING HIGH-SCHOOL AGRICULTURE. Fundamental elements of method in teaching as related to teaching agriculture in high school. Organizing subject matter of daily work; selection and manipulation of devices. Classroom and laboratory method. Specific plans for teaching secondary agriculture. BENDER.

141a,b. *TEACHING. Observation of regular classes; interpretation of class practices; preparation of lesson plans and actual teaching of classes under careful supervision in recitation and laboratory; criticism and discussion of plans, methods, and results of student's teaching. Students are admitted to this course only when recommended by the faculty of the division in which they are specializing and when accepted by the Division of Agricultural Education. BENDER, LUSK, STORM.

151a,b. ORGANIZATION AND MANAGEMENT. Organization and management of work in secondary schools, particularly of Minnesota, with special reference to agricultural work, courses of study, programs, equipment, laboratory and class management, extension work, plots, and coördination of work. STORM, LUSK.

161. FUNDAMENTALS OF AGRICULTURE. Essential for principals and superintendents of schools in which agriculture is taught, and valuable for students of other colleges whose time for agriculture is limited. Agricultural College experts will give work in their special fields. Not offered in 1917-18. BENDER.

162. FUNDAMENTALS OF AGRICULTURE. Continuation of Course 161. Credit is given for either course separately, but there is no duplication of subject matter and both should be taken to obtain a fundamental knowledge of agriculture. Not offered in 1917-18. LUSK.

171. EXTENSION WORK. Federal, state, and local extension aims, organization. Assembling and use of extension data and equipment. Development of extension methods especially as applied to the work in Minnesota. Not offered in 1917-18. STORM.

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* Students who are prepared may be required to do their teaching in manual training.

## AGRICULTURAL ENGINEERING

Professor John T. Stewart; Assistant Professors Jason L. Mowry, Harry B. Roe; Instructors Allen D. Johnston, Hall B. White, Lloyd R. Whitson.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1a,b. | Higher Algebra | 3 | Fr. | None |
| 2a,b. | Plane Trigonometry | 3 | Fr. | Higher Algebra |
| 3a,b. | Mechanical Drawing | 3 | Fr., soph. | None |
| 4. | Blacksmithing | 3 | All | None |
| 5. | Carpentry | 3 | All | None |
| 7. | Farm Structures | 3 | Sr. | 2, 3 |
| 8. | Agricultural Physics | 3 | Jr. | 2, 3 |
| 10. | Farm Engineering | 3 | Jr. | 2, 3 |
| 16. | Farm Power Machinery | 3 | Sr. | 8 |
| 17. | Advanced Blacksmithing | 3 | All | 4 |
| 18. | Surveying | 3 | Sr. | 2, 3 |

### INTRODUCTORY COURSES

1a,b. Higher Algebra. Special attention is given to practical problems, the methods of computation and a foundation for Plane Trigonometry. Roe.

2a,b. Plane Trigonometry. Theory and use of logarithms and a study of the functions of plane trigonometry with numerous practical applications. Roe.

3a,b. Mechanical Drawing. Lectures on drawing, exercise in the use of drawing instruments, lettering, and water colors. The making of working drawings with their practical value. Whitson.

4. Blacksmithing. The management of forge and fire and in bending, shaping, and welding iron. Johnston.

5. Carpentry. The use of common carpentry tools and the methods of farm building construction. White.

7. Farm Structures. The planning, designing, and location of farm buildings, including specifications and estimates of cost. Mowry.

8. Agricultural Physics. The principles of physics as applied to agriculture including ventilation, heating, lighting, water supply, and electricity. Mowry.

10. Farm Engineering. The principles of land surveys, the improvement of farm lands by drainage, explosives and their use, and a brief summary of road construction in agricultural districts. Stewart.

16. Farm Power Machinery. Flexible connectors, pulleys, shafting, gear wheels, bearings, oils, lubrication, and engines. Special emphasis placed on laboratory work. Mowry.

17. Advanced Blacksmithing. Bending, shaping, and welding steel and the tempering of steel tools. Johnston.

18. Surveying. Theory and practice of plane surveying applied to farm management. Mensuration, leveling, and farm mapping. Stewart.

## AGRONOMY AND FARM MANAGEMENT

Professors Andrew Boss, Coates P. Bull; Associate Professors Albert C. Arny, Herbert K. Hayes; Assistant Professors Louis B. Bassett, Alva H. Benton, Peter J. Olson, Francis W. Peck; Extension Specialists George J. Baker, Frank J. Brown, Thomas B. McCullough.

*General statement.*—For specialization in this department, see special requirements in Course of Study.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1a,b. | Farm Crops I | 3 | Fr. | None |
| 3b. | Farm Machinery | 3 | Sr. | None |
| 5. | Farm Crops II | 3 | Jr. | 1, Bot. 1 yr. |
| 7. | Farm Practices | None | Fr. | None |
| | *Advanced Courses* | | | |
| 101b. | Farm Management I | 3 | Jr., sr. | 1, Econ. 3 |
| 102a,b. | Farm Management II | 3 | Sr. | 1, Econ. 3; An. Husb. 7 or 11; Soils, 4 |
| *103. | Principles of Genetics | 3 | Sr. | Bot. 1 yr., An. Biol. 1 yr. |
| 104. | Grain and Corn Judging | 3 | Jr., sr. | 1, Bot. 1 yr. |
| *106. | Plant Breeding | 3 | Sr. | 103 |
| 108. | Farm Management III | 3 | Sr. | 101, 102 |

* Open to any student of the University having the required prerequisites.

### INTRODUCTORY COURSES

1a,b. Farm Crops I. An elementary study of the important field crops of the United States, with emphasis upon those of local importance; distribution, economic importance, agricultural classifications, cultural methods, and principles of improvement. Olson.

3b. Farm Machinery. Lectures, practical discussions and practice work in the best methods of adjustment, handling, and adapting various kinds of machinery to the soils, weeds, and seasons. Bassett.

5. Farm Crops II. A systematic study of the form and structure of the entire plants of the cereal, forage, fiber, and root crops adapted to the north central states. Arny.

7. Farm Practices. A laboratory course designed to give training and experience in the elementary farm operations. ............

### ADVANCED COURSES

101b. Farm Management I. Textbook and practice work in the art of record keeping, accounting, and kindred subjects. Designed especially for students expecting to become farm managers or farm-management field men. Peck.

102a,b. Farm Management II. A course in which the business side of farming is emphasized. Special attention is given to farm organization, equipment, and operation. Boss.

103. Principles of Genetics. Given jointly by the Division of Agronomy and Farm Management and the Division of Horticulture. Same as Hort. 109. Lectures and laboratory work designed to familiarize the student with the underlying principles of breeding. Heredity, variation, biometry, and evolution are emphasized. Hayes, Dorsey.

104. Grain and Corn Judging. A study in detail of representative samples of the leading varieties of grains and corn and grass seeds, with score card practice in comparative judging of grain, corn, and grass seed. Arny.

106. Plant Breeding. Given jointly by the Division of Agronomy and Farm Management and the Division of Horticulture. Same as Hort. 110. Applied genetics is emphasized. The method of breeding each of the important agricultural and horticultural crops with special attention to experiment station investigations and to the methods used by plant breeders. Hayes, Dorsey.

108. Farm Management III. An advanced seminar course including farm practices, farm equipment, cost of production, and efficiency of labor. Boss, Peck.

## ANIMAL HUSBANDRY

### ANIMAL INDUSTRY GROUP

Professor Carl W. Gay; Assistant Professors Robert G. Ashby, Joseph S. Montgomery, Thomas G. Paterson; Instructors Philip A. Anderson, Jay J. Viets; Assistant Alden W. Malcomson.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1a,b. | Types and Breeds of Livestock...... | 3 | Fr., soph. | None |
| 3. | Market Classes of Livestock........ | 3 | Soph., jr. | 1 |
| 4. | Livestock Judging.................. | 1½ | Soph., jr. | 3 |
| 5. | Livestock Breeding II.............. | 2 | Sr. | Vet. Sci. 4 |
| 6. | Horse Power ....................... | 1 | Soph. | 1 |
| 7. | Livestock Feeding and Management. | 4 | Sr. | An. Nutr. 1 |
| 9. | Meats ............................. | 3 | Sr. | 4, An. Nutr. 1 |
| 11. | Elements of Feeding................ | 3 | Jr. | None |

*Advanced Courses*

| | | | |
|---|---|---|---|
| 101. Advanced Stock Judging | 3 | Sr. | 4 |
| 104. Horse Husbandry | 2 | Sr. | 4, 5, 7 |
| 106. Beef Cattle Husbandry | 2 | Sr. | 4, 5, 7 |
| 108. Sheep Husbandry | 2 | Sr. | 4, 5, 7 |
| 110. Swine Husbandry | 2 | Sr. | 4, 5, 7 |
| 112. Advanced Meats | 5 | Sr. | 9 |
| 114. Feeding Seminar | 3 | Sr. | 7 |
| 116. Applied Swine Husbandry | 1-3 | Sr. | 7, see statement |

### INTRODUCTORY COURSES

1a,b. TYPES AND BREEDS OF LIVESTOCK. The types as related to performance or production in horses, beef cattle, sheep and swine, and the origin, history, characteristics and economic importance of the breeds, classified according to type. GAY.

3. MARKET CLASSES OF LIVESTOCK. The market classes of cattle, sheep, and swine, and practice work in judging market classes. PATERSON.

4. LIVESTOCK JUDGING. Practice in judging breeding classes of horses, beef cattle, sheep, and swine. Placings and reasons are submitted, followed by a general discussion with the instructor. MONTGOMERY.

5. LIVESTOCK BREEDING II. The application of the principles of genetics to the breeding of livestock, a consideration of practical breeder's problems concluded by general pedigree work in the stud, herd, and flock books. GAY.

6. HORSE POWER. The horse as a motor; mechanics of locomotion; the types and classes of horses adapted to the different kinds of horse labor. GAY.

7. LIVESTOCK FEEDING AND MANAGEMENT. Feeding livestock under farm conditions; equipment; management. Efficiency and economy in growing and fattening meat animals; feeding draft horses and colts. Consideration of experimental work and present practice. Practical feeding problems. Only partial credit allowed to those who have completed Course 11. ASHBY.

9. MEATS. General course in the dressing of animals and the cutting of carcasses. Lectures and laboratory work. PATERSON.

11. ELEMENTS OF FEEDING. A general course giving a brief survey of livestock and dairy feeding designed for those students not specializing in either animal or dairy husbandry. Not open to those who have completed Course 7. ASHBY, KILDEE.

### ADVANCED COURSES

101. ADVANCED STOCK JUDGING. Continuation of Course 4. The selection of breeding horses, beef cattle, sheep and swine. Stock farms in the vicinity of the Twin Cities visited in connection with this course. ASHBY, MONTGOMERY.

104. Horse Husbandry. The feeding, breeding, management, and marketing of horses. Studbook registration, pedigrees, and blood-lines with relation to breed improvement. Practicums dealing with breaking colts, stable management, and fitting for show purposes. Montgomery.

106. Beef Cattle Husbandry. The management of pure-bred herds of beef cattle, building equipment, food stuffs suitable, selection of foundation stock, methods of improvement, and marketing. Pedigrees, herd book registrations, and practicums. Paterson.

108. Sheep Husbandry. The care and management of pure-bred sheep, study of pedigrees, registrations, fitting for show purposes, marketing. Practicums in feeding, shearing, blocking, and caring for young lambs. Paterson.

110. Swine Husbandry. Cost of producing pork; equipment; swine types; purebred vs. market hogs; building a breeding herd; feeding; marketing breeding stock; herd management; pedigree studies; fitting and showing. Barn work and feeding practice. Ashby.

112. Advanced Meats. Continuation of Course 9. More attention is given the more important details concerning meat, its physical and chemical composition. Paterson.

114. Feeding Seminar. Review of recent bulletins, dealing with the results of experiments in feeding horses, beef cattle, sheep, and swine, as published by the various experiment stations. Montgomery.

116. Applied Swine Husbandry. Individual problems offering to those most interested in this phase of animal production, opportunity for additional and specialized work. Admission only upon approval of instructor. Ashby.

## ANIMAL NUTRITION

### ANIMAL INDUSTRY GROUP

Professor Theophilus L. Haecker; Assistant Professor Gustav W. Gehrand.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Course* | | | |
| 1. | Principles of Nutrition | 3 | Jr. | Vet. Sci. 24 |
| | *Advanced Course* | | | |
| 101. | Studies in Animal Nutrition | 3 | Sr. | 1 |

### INTRODUCTORY COURSE

1. Principles of Nutrition. The principles of animal nutrition, their relation to the economic production of animal products, and the re-

lation of the constituents in feed consumed to amount and character of products yielded. HAECKER, GEHRAND.

### ADVANCED COURSE

101. STUDIES IN ANIMAL NUTRITION. Analysis of the problem of animal nutrition; the relationship of food consumed to milk production; utilization of nutrients in beef and pork production; and the distribution in the body. HAECKER.

## BEE CULTURE

Professor FRANCIS JAGER; Instructor LLOYD V. FRANCE.

*General statement.*—Theoretical and practical instruction on bees, honey, and wax production. At least one year of botany should be completed before electing these courses. General Zoology and Economic Entomology are also desirable. If not already completed they should be taken at same time as the courses in Bee Culture.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 6. | Elements of Beekeeping | 3 | Jr., sr. | None |
| 7. | Advanced Beekeeping | 3 | Jr., sr. | 6 |

### INTRODUCTORY COURSES

6. ELEMENTS OF BEEKEEPING. Elementary study of queens, drones, and workers, hives and appliances, handling of bees, spring, summer, winter management, swarming and increase, honey and wax production, feeding and bee diseases. JAGER, FRANCE.

7. ADVANCED BEEKEEPING. Anatomy of the bee, queen rearing, commercial production of honey, out apiaries, accounting and marketing. JAGER, FRANCE.

## DAIRY HUSBANDRY

### ANIMAL INDUSTRY GROUP

Professors HENRY H. KILDEE, ROBERT M. WASHBURN; Assistant Professor GUSTAV W. GEHRAND; Instructors EDWIN O. HANSON, ........; Extension Specialists ARTHUR J. MCGUIRE, WILLIAM A. MCKERROW.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 2. | Dairy Stock Feeding and Management | 3 | Jr., sr. | Nutr. 1 |
| 4. | Dairy Stock Judging | 1½ | Soph. | 7 |
| 5. | Factory Management | 3 | Jr., sr. | 11 |

| | | | |
|---|---|---|---|
| 6. Factory Butter-Making | 3 | Jr., sr. | 11 |
| 7a,b. Elements of Dairy Husbandry | 3 | Fr. | None |
| 9. Cheese Making Practice | 3 | Jr., sr. | 11 |
| 10. Creamery Practice | 3 | Jr., sr. | 11 |
| 11. Milk and Its Products | 3 | Soph., jr. | 7 |
| 12. Dairy Cattle Feeding | 1 | Jr., sr. | Nutr. 1, or parallel |
| *Advanced Courses* | | | |
| 101. Seminar | 2 | Sr. | 2, 4, 11 |
| 102. Advanced Study of Dairy Breeds | 3 | Jr., sr. | 4 |
| 104. Special Problems | 3 | Jr., sr. | 2, 4, 11 |

## INTRODUCTORY COURSES

2. Dairy Stock Feeding and Management. Characteristics and values of concentrates, roughages and succulent feeds for efficient and economical milk production. Also shelter, care and management of different classes of dairy stock. Barn plan. Only partial credit allowed to those who have completed Course 12. Kildee.

4. Dairy Stock Judging. Relation of form to function. Practice work in comparative judging of dairy cattle of different breeds and ages. Herds in the vicinity of the Twin Cities are visited. Kildee.

5. Factory Management. Organization of Creamery Associations, the construction and equipment of factories, with lectures on calculating dividends, sinking fund, locating financial leaks and marketing. Washburn.

6. Factory Butter Making. The separation of milk, preparation of pure culture starters, cream ripening, churning, controlling composition of butter, market requirements and scoring of butter. Washburn.

7a,b. Elements of Dairy Husbandry. Origin, characteristics and adaptations of the dairy breeds of cattle. Beginning judging. Milk, its composition and testing. Cream separation and buttermaking. Gehrand, Washburn, Hanson.

9. Cheese Making Practice. A minimum of one month's experience in an approved practical cheese factory is advised of all students specializing in dairy manufacture. Records are kept and reports made of work. Washburn.

10. Creamery Practice. One month's experience in an approved practical creamery is required of all students specializing in dairy manufacture. Records are kept and reports made of the work. Washburn.

11. Milk and Its Products. Milk secretion, composition, properties, variation and testing. Cream separation, testing, care, methods of marketing. Butter, cheese and ice cream making. Market milk handling, standardizing, clarifying, pasteurizing, bottling and marketing. Washburn.

12. Dairy Cattle Feeding. Characteristics and relative merits of concentrates, roughages and succulent feeds for efficient and economical production. Not open to those who have completed Course 2. Gehrand.

### ADVANCED COURSES

101. Seminar. Survey of the recent developments in the field of dairy husbandry. Papers and discussion. Kildee.

102. Advanced Study of Dairy Breeds. Origin, history and characteristics of the more important strains and families of the leading breeds of dairy cattle. Judging and pedigree work. Herds near the Twin Cities are visited. Kildee.

104. Special Problems. Individual studies and reports upon definite problems connected with dairy husbandry either in the field of production or manufacture. Kildee, Washburn.

## ECONOMIC ZOOLOGY

Professor Frederic L. Washburn; Associate Professor Arthur G. Ruggles; Assistant Professors Charles W. Howard, William Moore.

*General statement.*—For specialization in this department, see special requirements in Course of Study.

Courses in this division are closely correlated with those offered by the Department of Animal Biology of the College of Science, Literature, and the Arts. For courses of that department see page 58.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 3. | Economic Entomology | 3 | Jr. | An. Biol. 3-4 |
| 4. | Economic Vertebrate Zoology | 2 | Jr., sr. | An. Biol. 3-4 |
| 5. | Forest Entomology | 3 | Jr. | An. Biol. 3-4 |
| 9. | Animal Parasites | 3 | Jr., sr. | An. Biol. 3-4 |
| 11. | Nursery Inspection | 2 | Jr., sr. | *18 |
| 12. | Forest Zoology | 2 | Jr. | An. Biol. 3-4 |
| 14. | Insects and Public Health | 2 | Jr., sr. | An. Biol. 3-4 |
| 16. | Plant Pest Control | 3 | Jr., sr. | 3, Pl. Path. 1 |
| 18. | Control of Insect Pests | 3 | Jr., sr. | 3, Pl. Path. 14, Hort. 1 sem. |
| | *Advanced Courses* | | | |
| 104. | Methods in Econ. Ent. | 3 | Jr., sr. | 3 |
| 105-106. | Special Problems | 6 | Jr., sr. | 104 |
| 107-108. | Immature Stages of Insects | 3 or 6 | Jr., sr. | 3 |
| 109-110. | Action of Insecticides | 3 or 6 | Jr., sr. | 3 |

* This may be taken parallel with course 11.

## INTRODUCTORY COURSES

3. Economic Entomology. The most important insect pests; methods of control; insecticides and insecticidal apparatus; beneficial insects. Each student makes a collection of insects. Washburn, Ruggles, Howard, Moore.

4. Economic Vertebrate Zoology. The relation of birds and four-footed wild animals to agriculture. Laboratory and field work. Identification of Minnesota birds affecting the horticulturist and agriculturist; also of vertebrate farm pests, habits, methods of combating. Washburn.

5. Forest Entomology. A special study is made of insects effecting shade and forest trees and the best means of controlling them. Ruggles.

9. Animal Parasites. Parasitism and the more common animal parasites of man and domestic animals. Howard, Boyd.

11. Nursery Inspection. Practical work in inspection of nurseries and imported nursery stock. State laws; of quarantine rulings and reasons therefor; study of methods in field and office. Washburn.

12. Forest Zoology. Forest animals. Relations of birds and of various four-footed animals to forest protection. Habits, range, usefulness; the manner of protecting the important large and small game, fish, birds; fish culture. Washburn.

14. Insects and Public Health. The agency of insects and insect-like animals in the transmission of diseases; methods of sanitation related to their control and disease transmission. Howard.

16. Plant Pest Control. Given jointly by the Division of Economic Zoology and the Division of Plant Pathology and Botany. Same as Pl. Path. and Bot. 6. The theory and practice of control of insect and fungous pests of crop plants. Practical applications. Not open to those who have completed course 18 or Pl. Path. and Bot. 14. Given in alternate years. Not offered in 1917-18. Ruggles, Stakman, Bisby.

18. Control of Insect Pests. The principal insects of the orchard and garden are studied in detail. The last part of the course deals with spray materials and their method of application. Not open to those who have completed course 16. Given in alternate years. Offered in 1917-18. Ruggles, Moore.

## ADVANCED COURSES

104. Methods in Economic Entomology. Methods of breeding insects; identification of insects in various stages; photography of insects; general field work. Moore.

105-106. **Special Problems.** Special problems for those intending to specialize in entomology or economic zoology. Problems may be chosen in any section of the Division. Attendance is expected during the Summer Session. Washburn, Ruggles, Howard, Moore.

107-108. **Immature Stages of Insects.** Immature forms of economic insects. Laboratory work. Ruggles.

109-110. **Action of Insecticides.** The common insecticides and their action on insects and their hosts. Laboratory and conference work. Moore.

## HOME ECONOMICS

Professor Josephine T. Berry; Instructor Bessie E. Bemis.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Course* | | | |
| 24. | Camp Cookery | 2 | Fr. | None |

For additional courses see the bulletin of the College of Agriculture, Courses in Home Economics.

### INTRODUCTORY COURSE

24. **Camp Cookery.** Designed to give prospective foresters, engineers, and others a knowledge of the simpler cookery processes, and of such adaptations as are practicable in the several types of out-of-doors camps. Bemis.

## HORTICULTURE

Associate Professors Le Roy Cady, Maxwell J. Dorsey; Assistant Professors Wilfrid G. Brierley (Chairman), Richard Wellington; Instructor William T. Tapley; Extension Specialist Roger S. Mackintosh.

*General statement.*—For specialization in this department, see special requirements in Course of Study.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 4. | Commercial Fruit Growing | 4 | Soph., jr., sr. | Bot. 1 yr., Hort. 1 sem. |
| 19. | Fruit Handling | 4 | Jr., sr. | 4, 21, Econ. 3 |
| 21b. | Small Fruits and Viticulture | 3 | Soph., jr., sr. | Bot. 1 yr. |
| 32. | Market Gardening | 3 | Soph., jr., sr. | Bot. 1 yr. |
| 33. | Vegetable Forcing | 3 | Jr., sr. | 32 |
| 34. | Commercial Potato Growing | 3 | Jr., sr. | Bot. 1 yr. |
| 50. | Floriculture | 3 | Soph., jr., sr. | None |
| 54. | Greenhouse Construction and Management | 1½ | Jr., sr. | None |

| | | | | |
|---|---|---|---|---|
| 56. | Plant Propagation | 1 | Soph., jr., sr. | None |
| 71. | Landscape Gardening | 3 | Soph., jr., sr. | None |
| 73. | Nursery Practice | 1½ | Soph., jr., sr. | None |
| 90a,b. | General Horticulture | 3 | All | None |
| 94. | Home and School Gardening | 3 | Jr., sr. | None |

*Advanced Courses*

| | | | | |
|---|---|---|---|---|
| 101. | Advanced Fruit Growing | 3 | Jr., sr. | 4, 21 |
| 103. | Tropical Fruits | 3 | Sr. | 4, 21 |
| 105. | Systematic Pomology | 3 | Jr., sr. | 4, 21 |
| 107. | Orchard Management | 3 | Sr. | 19 |
| 109. | Principles of Genetics | 3 | Sr. | Bot. 1 yr., An. Biol. 1 yr. |
| 110. | Plant Breeding | 3 | Sr. | 109 |
| 131. | Advanced Market Gardening | 3 | Sr. | 32 |
| 151-152. | Advanced Floriculture | 6 | Sr. | 50, 54 |
| 191. | Hort. Literature | 3 | Sr. | 4 |
| 193-194. | Hort. Seminar | 2 | Sr. | 12 cred. excl. of 90 and 94 |

## INTRODUCTORY COURSES

4. Commercial Fruit-Growing. The fundamental principles of fruit-growing. Sites, soils, nursery stock, planting and planting plans, tillage, fertilization, cover crops, pollination, frost avoidance, pruning, and thinning. Lectures, recitations, references, and laboratory work. Brierley.

19. Fruit Handling. Lectures on early development, packages, harvesting, packing, by-products, coöperation, marketing, and storage. Laboratory in picking and packing of fruits, reference work on marketing and storage. Alternates with 107. Not offered in 1917-18. Brierley.

21b. Small Fruits and Viticulture. Lectures, references, and laboratory. Botanical relationship, important species, origin, commercial development, importance, climatic range, sites, soils, propagation, planting plans, planting, pruning, cultivation, irrigation, cover-crops and mulching, inter-cropping and varieties. Brierley.

32. Market-Gardening. The principles of vegetable-growing for market, including all important vegetable crops from seed to harvest. Lectures, recitations, references, laboratory work, and excursions. Tapley.

33. Vegetable Forcing. The growing and handling of the vegetable forcing crops; types and management of houses. Lectures, reference reading, field trips, and laboratory. Tapley.

34. Commercial Potato Growing. Lectures, references, field and laboratory practices. Preparation of the soil, planting, cultivating, harvesting, storing, classifying varieties, treating and selecting seed, exhibiting, judging, and scoring. Wellington.

50. FLORICULTURE. Designed to give the student a working knowledge of the culture and uses of common house plants, annuals, perennials, and greenhouse plants. Lectures, reference reading, and laboratory. CADY.

54. GREENHOUSE CONSTRUCTION AND MANAGEMENT. The evolution of the greenhouse, types of houses, materials, and methods of construction. Lectures, field trips, and laboratory work. CADY.

56. PLANT PROPAGATION. Methods of propagation of plants by seed, cuttings, layers, grafting, and budding. The principles of greenhouse management, transplanting, watering, and ventilation. Lectures, reference reading, field and laboratory work. CADY.

71. LANDSCAPE GARDENING. The practice and principles of landscape gardening as applied to the home and community. Lectures and field trips to parks and private grounds. CADY.

73. NURSERY PRACTICE. Lectures and practice work in management of nursery stock, seeds, bulbs, and plants, particular attention being given to ornamental stock propagation, planting, and storage. CADY.

*90a,b. GENERAL HORTICULTURE. A general survey of horticulture including the elementary principles of fruit-growing, vegetable gardening, floriculture, landscape gardening, and plant propagation. BRIERLEY, TAPLEY.

94. HOME AND SCHOOL GARDENING. Lectures and laboratory. The elements of horticulture as applied to high-school instruction, plant propagation, fruit growing, home gardening, school gardening, and the planning of home and school grounds. Same as Agr. Educ. 68. BRIERLEY, LUSK, CADY, WELLINGTON, TAPLEY.

### ADVANCED COURSES

101. ADVANCED FRUIT-GROWING. Lectures, laboratory, and special problems. The tree fruits. Similar in outline to course 21b. BRIERLEY.

103. TROPICAL FRUITS. Lectures, references, and special problems. The tropical and citrus fruits. Similar in outline to course 21b. Not offered in 1917-18. BRIERLEY.

105. SYSTEMATIC POMOLOGY. The classification and distribution of temperate, sub-tropical, and tropical fruits; technical description, identification, and general study of the more important varieties; judging of fruits; fruit literature. Lectures, laboratory work, references. WELLINGTON.

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* Students specializing in Horticulture may substitute for Hort. 90 any course in Horticulture for which they are eligible. Students majoring in other divisions who desire to take more specialized work in Horticulture may substitute Hort. 4, 21, 32, 34, 50, or 71, provided that a second course from the same group be elected later. Students majoring in Agricultural Education will take Hort. 94 in the junior year.

107. Orchard Management. Lectures, references, laboratory, and special problems. The principal problems connected with the management of orchard and small fruit tracts. Alternates with 19. Offered in 1917-18. Brierley.

109. Principles of Genetics. Given jointly by the Division of Horticulture and the Division of Agronomy and Farm Management. Same as Agron. 103. Lectures and laboratory work designed to familiarize the student with the underlying principles of breeding. Heredity, variation, biometry, and evolution are emphasized. Dorsey, Hayes.

110. Plant Breeding. Given jointly by the Division of Horticulture and the Division of Agronomy and Farm Management. Same as Agron. 106. Applied genetics is emphasized. The method of breeding each of the important agricultural and horticural crops, with special attention to experiment station investigations and to the methods used by plant breeders. Dorsey, Hayes.

131. Advanced Market-Gardening. Lectures, references, and special problems. A study in detail of the various vegetables. Wellington.

151-152. Advanced Floriculture. Lectures, assigned readings, laboratory, and special problems dealing with the culture, botany, and history of florists' plants and methods of greenhouse management. Cady.

191. Horticulture Literature. A critical study of foreign and native horticultural literature, and the methods used in the preparation of fruit monographs and bulletins. A knowledge of French and German will be a valuable asset. Lectures. Wellington.

193-194. Horticultural Seminar. Required of all graduate students and of seniors electing special problem work. Reports and discussion of problems and investigational work. Brierley, Wellington.

## MILITARY SCIENCE AND TACTICS

Professors George W. Moses (Commandant), Theodore B. Taylor, James B. Woolnough, Owen R. Meredith; Brigade Adjutant Walter F. Rhinow; Band Instructor Bert Rose.

*General statement.*—All students are required to take military drill and instruction during the first two years of attendance unless they have previously attended a school in which a senior unit of the Reserve Officers Training Corps has been established. No credits are allowed for this work.

All juniors and seniors who have completed two years of drill may register for the course required by General Order 49 War Department for members of the Reserve Officers Training Corps. When this course is entered upon it must be carried to completion as a prerequisite for promotion or graduation.

Juniors and seniors who take the course required by General Order 49, which includes two camps of four weeks each, will receive an allowance of thirty cents per day for subsistence while pursuing the course and will have all expenses paid to and from the encampments. They also are eligible for appointment as temporary second lieutenants in the Infantry branch of the Regular Army for six months, with a salary of one hundred dollars per month, upon graduation, and a commission in the Reserve Corps. The Reserve Corps furnishes officers for Citizens' Training Camps in time of peace and commissioned officers in the United States Volunteers in time of war, such officers having preference for commissions in the volunteers immediately below experienced officers in the federal service.

The course includes three hours drill per week and three lecture periods per week in the Military Department and a course in Military History and International Law in the proper departments of the University. It carries three credits in each semester in the department of Military Science and Tactics, and three additional credits in each of the extra studies—18 credits in all.

## MUSIC

Professor Carlyle Scott; Assistant Professor Donald Ferguson; Instructors Maximilian Dick, Abe Pepinsky.

*General statement.*—Credit is offered to seniors and juniors in the College of Agriculture who may wish to elect work in the Department of Music. Six credits may be obtained. The following courses are recommended:

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 15-16. | Violin | 4 | Jr., sr. | See statement |
| 23-24. | Chorus | 1 | Jr., sr. | None |
| 25-26. | Orchestra | 1 | Jr., sr. | None |

For additional courses see the bulletin of the College of Science, Literature, and the Arts.

### INTRODUCTORY COURSES

15-16. Violin. Candidate must be able to play the first ten of Kruetzer's forty etudes, and the easier Handel and Mozart sonatas. Dick, Pepinsky.

23-24. Chorus. A popular course in choral practice for four-part mixed voices. Scott.

25-26. Orchestra. Ferguson, Pepinsky.

# PHYSICAL EDUCATION

## FOR MEN

Director LOUIS J. COOKE; Assistant Director WILLIAM K. FOSTER; Instructors D. C. MITCHELL, JOHN C. WEST; Assistant BOTTOLF M. OHNSTAD.

The purpose of the department is to provide all men of the University opportunity for exercise in order to maintain and build up their general health. It also provides special training for the correction of physical defects and functional derangements.

A physical examination is required of all new matriculants, and of all others using the department privileges, at the beginning of the year, and as often during their college course as their physical condition may indicate. Students taking the required work in physical education are examined also at the close of the year. A study of these records shows a marked improvement in the standard of health of the average student during his college course.

The gymnasium, swimming pool, and baths are open to all students of the University, who are free to use the apparatus and to pursue a course in physical training under the supervision of the director and his assistants.

Those students, taking the required course in physical education, who can not swim, must make a reasonable effort, as determined by the department, to pass the swimming and life-saving requirements, and will be assigned special hours for instruction.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| 1. | Personal Hygiene | None | Fr. | None |
| *3a,b. | Gymnasium | None | Fr. | None |
| 5-6. | Intermediate Gymnastics | None | Fr. | None |
| †7-8. | Advanced Leaders | 2 | Soph., jr., sr. | 1, 3-4, 5-6 |
| 9-10. | Corrective Gymnastics | None | All | None |
| 11-12. | Wrestling | None | Soph., jr., sr. | None |
| 13-14. | Advanced Gymnastics | None | Soph., jr., sr. | None |
| 15-16. | Intermediate Swimming | None | All | None |
| 17-18. | Advanced Swimming | None | All | 15-16 |

* Given at the University Farm.

† Both semesters must be completed before credit is given for the first semester.

1. PERSONAL HYGIENE. Two hours per week; first six weeks of first semester. Examination at close of course. COOKE.

*A special lecture* on sex hygiene is given sometime during the first ten days of the autumn semester, with required attendance on the part of all freshmen.

3a,b. GYMNASTICS. Two hours a week, last twelve weeks of first semester or first twelve weeks of second semester. Required qualifications in swimming, life-saving, bar-vaulting, jumping, sprinting, running, and on heavy apparatus. MITCHELL.

5-6. INTERMEDIATE GYMNASTICS. Elective for freshmen showing exceptional ability in elementary apparatus work. FOSTER, WEST.

7-8. CLASS LEADERS (ADVANCED). Three hours a week. FOSTER, WEST.

9-10. CORRECTIVE GYMNASTICS. Three hours a week. Special individual courses for students physically defective. OHNSTAD.

11-12. WRESTLING. Course in competitive wrestling. Most promising candidates chosen to represent Minnesota at the Western Intercollegiate Gymnastic and Wrestling Meet. (Optional.) FOSTER, OHNSTAD.

13-14. ADVANCED GYMNASTICS. Same as Course 11 and 12 except that it is in gymnastics instead of wrestling. Includes course in ground tumbling, horizontal bar, parallel bars, side horse, and flying rings. FOSTER, WEST.

15-16, 17-18. SWIMMING, INTERMEDIATE AND ADVANCED. Life saving, efficiency swimming, and fancy diving. Instruction is given in rescuing and restoring the apparently drowned and other useful swimming accomplishments. FOSTER, OHNSTAD.

## PLANT PATHOLOGY AND BOTANY

Professor EDWARD M. FREEMAN; Associate Professor ELVIN C. STAKMAN; Assistant Professor WIELAND L. OSWALD; Instructors GUY R. BISBY, ROBERT C. DAHLBERG, ESTELLE LOUISE JENSEN; Extension Specialist ARNE G. TOLAAS.

*General statement.*—For specialization in this department, see special requirements in Course of Study.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1. | Plant Pathology | 3 | Jr. | Bot. 1 yr. |
| 6. | Plant Pest Control | 3 | Jr., sr. | 1, Econ. Zool. 3 |
| 7. | Weeds and Grasses | 3 | Soph., jr., sr. | Bot. 1 yr. |
| 9. | Weeds and Seed Testing | 3 | Soph., jr., sr. | Bot. 1 yr. |
| 10. | Forest Pathology | 3 | Soph. | Bot. 1 yr. |
| 12. | Seed Problems | 3 | Jr., sr. | 9 |
| 14. | Plant Disease Control | 3 | Jr., sr. | 1, Econ. Zool. 3 |
| | *Advanced Courses* | | | |
| 103. | Bacterial Diseases | 3 | Jr., sr. | 1, Path. 6 |
| 104. | Principles of Pathology | 3 | Jr., sr. | 1, Path. 6 |

### INTRODUCTORY COURSES

1. PLANT PATHOLOGY. Elementary study of plant diseases due to fungi bacteria and slime molds; life-histories and preventive methods. Lec-

ture, laboratory, and reference. Not open to those who have completed course 10. FREEMAN, JENSEN.

6. PLANT PEST CONTROL. Given jointly by the Division of Plant Pathology and Botany and the Division of Economic Zoology. Same as Econ. Zool. 16. The theory and practice of control of insect and fungous pests of crop plants. Practical applications. Not open to those who have completed course 14 or Econ. Zool. 18. Given in alternate years; not offered in 1917-18. STAKMAN, RUGGLES, BISBY.

7. WEEDS AND GRASSES. Agricultural and applied botanical study of weeds and grasses with special reference to agricultural importance. OSWALD.

9. WEEDS AND SEED TESTING. Detailed study of seed testing methods and seed legislation. Weed and crop seeds and weed plants studied with special reference to identification. OSWALD, DAHLBERG.

10. FOREST PATHOLOGY. Elementary study of plant diseases due to fungi, bacteria, and slime-molds; life histories and preventive methods. Lectures, laboratory, and reference. Not open to those who have completed course 1. FREEMAN, STAKMAN.

12. SEED PROBLEMS. Special seed problems are assigned. Advanced work in seed testing methods. OSWALD, DAHLBERG.

14. PLANT DISEASE CONTROL. A detailed study of methods of controlling diseases of plants of parasitic origin. Spray materials and spray machinery. Practical applications. Not open to those who have completed course 6. Given in alternate years; offered in 1917-18. STAKMAN, BISBY.

### ADVANCED COURSES

103. BACTERIAL DISEASES. Morphology, classification, and physiology of phytopathogenic bacteria; general phenomena of bacterial infection and host reaction; detailed study of plant diseases caused by bacteria and filterable viruses. STAKMAN.

104. PRINCIPLES OF PATHOLOGY. Comparative biology of plant pathogens; pathological plant anatomy, parasitism, biologic specialization, resistance, and immunity. STAKMAN.

## POULTRY HUSBANDRY

### ANIMAL INDUSTRY GROUP

Professor ARTHUR C. SMITH; Instructor DWIGHT J. LANE.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1. | Poultry | 3 | All | None |
| 2. | Poultry Judging | 3 | All | 1 |
| 4. | Incubating and Brooding | 2 | All | None |

### INTRODUCTORY COURSES

1. Poultry. The poultry industry; best methods of care and management of fowls, turkeys, ducks, and geese, and the most important breeds of same. Smith.

2. Poultry Judging. The history, standard-requirements, and common defects of the leading commercial, standard-breeds and varieties and determination and standard-values by the score card and comparison methods. Smith.

4. Incubating and Brooding. Instruction and practice in incubation and brooding, selection of breeding stock and eggs for hatching, and feeding young chicks. Of practical value to teachers of agriculture and poultry-raisers. Smith, Lane.

## RHETORIC

Assistant Professor Robert C. Lansing; Instructors Estelle Cook, George G. Glick, Ruth Mohl.

*General statement.*—Rhetoric credits will not be granted officially until the close of the first semester of the senior year.

At least one quiz paper will be selected at random each semester from other than rhetoric classes and read by the Rhetoric section. In addition any instructor may nominate and submit papers for any junior or senior who in his opinion requires special consideration.

The Rhetoric section may require upper-class students to take, without credit, additional courses in rhetoric in order to validate their freshman and sophomore rhetoric credits.

Until June, 1918, students registered previous to September, 1915, may be required to take a supplementary three-credit course in rhetoric in place of three of the elective credits required for the degree.

Students whose work in Rhetoric 1 shows at any time an inadequate knowledge of the conventions of English will be required to drop the course and enter Rhet. 3. These students will be required to complete fifteen credit hours of work in rhetoric.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1a,b. | Rhetoric | 3 | Fr. | None |
| 2a,b. | Rhetoric | 3 | Fr. | 1 |
| 3a,b. | Elementary Rhetoric | 3 | Fr. | None |
| 11a,b. | Argumentation | 3 | Soph., jr. | 2 |
| 22a,b. | Public Speaking | 3 | Soph., jr. | 11 |
| 24a,b. | Adv. Public Speaking | 3 | Soph., jr., sr. | 22 or 25 |
| 25a,b. | Fundamentals of Vocal Expression | 2 | Soph., jr., sr. | 2 |

### INTRODUCTORY COURSES

1a,b. Rhetoric. Note taking, thesis writing, oral and written exposition, sentence and paragraph structure, analysis of prose models, book reviews. Lansing, Glick, Mohl.

2a,b. Rhetoric. Description, narration, diction, argumentation, oral composition, book reviews. Lansing, Glick, Mohl.

3a,b. Elementary Rhetoric. Elementary grammatical and rhetorical principles. Mohl.

11a,b. Argumentation. Evidence, reasoning, briefing, debating. Lansing, Glick, Mohl.

22a,b. Public Speaking. The fundamentals of effective public speech and practice in organizing and delivering short occasional addresses. Glick.

24a,b. Advanced Public Speaking. The preparation and delivery of the informal lecture. A study of the rules of order and practice in conducting assemblies. Glick.

25a,b. Fundamentals of Vocal Expression. The fundamental principles of voice production, articulation, gesture, platform deportment, and expression. Cook.

## RURAL AND AGRICULTURAL JOURNALISM

Associate Professor William P. Kirkwood; Instructor L. Gerald Hood.

*General statement.*—The aim of this Division is to give practical training in rural and in agricultural journalism. The work in rural journalism includes the editing and management of the country newspaper. The work in agricultural journalism covers writing for the rural press, for the agricultural press, bulletin writing, and agricultural publicity.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1. | Rural Press and Rural Life....... | 1 | Soph., jr., sr. | Rhet. 1 yr. |
| *2. | Reporting ........................ | 3 | Soph., jr., sr. | Rhet. 1 yr. |
| *3. | Advanced Reporting ............. | 3 | Jr., sr. | 2 |
| *4. | News Editing .................... | 3 | Jr., sr. | 3 and 5 |
| *5. | Copy-Reading .................... | 3 | Jr., sr. | 3 or parallel 3 |
| 6. | Business Administration .......... | 3 | Sr. | 4 |
| 7. | Editorial Administration .......... | 3 | Sr. | 4 |
| 9. | Bulletin Writing ................. | 3 | Sr. | 11-12 |
| 10. | Agricultural Publicity ............ | 1 | Sr. | 11-12 |
| 11-12. | Agricultural Journalism .......... | 6 | Jr., sr. | Rhet. 2 yrs. or Rhet. 1 yr., Eng. 1 yr.† |

* Courses 2, 3, 4, and 5 will be given by this Division in case they are not offered in the College of Science, Literature, and the Arts.

† Rur. and Agr. Jour. 2 also advised as a prerequisite.

### INTRODUCTORY COURSES

1. Rural Press and Rural Life. The relations of the rural press to rural and community life; rural problems and how the rural press may be influenced by and assist in their solution. Kirkwood.

2. Reporting. Organization, methods and material in newspaper production; forms of newspaper stories; methods of gathering and writing news; laboratory practice by assignments on University publications. ............

3. Advanced Reporting. More extended practice in actual work on University publications. ............

4. News Editing. Continuation of course 5 with special attention to the subject of type, make up and printing. Laboratory practice on University publications. ............

5. Copy Reading. Study and practice in editing copy for the newspaper and in writing headlines. ............

*6. Business Administration. The business problems of the rural weekly including general accounting, job cost accounting, circulation building and advertising problems. Hood.

7. Editorial Administration. The editor in his capacity as editor; formulation of policy; organization of news-gathering staff; presentation of the news to the public. Kirkwood.

9. Bulletin Writing. The application of the rules of writing for the press to the preparation of popular and technical bulletins with some attention to style in articles for scientific papers. Kirkwood.

10. Agricultural Publicity. Mediums and methods through and by which useful and valuable information may be brought to the attention of communities and the people of the open country. Kirkwood.

11-12. Agricultural Journalism. Gathering and writing agricultural news and the writing of articles for the agricultural press and other class papers. Lectures and practical work on Agricultural College publications. Hood.

## SOILS

Professor Frederick J. Alway; Associate Professor ................; Instructors Paul R. McMiller, Clayton O. Rost; Extension Specialist George H. Nesom.

*General statement.*—For specialization in this department see special requirements in Course of Study.

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* Special courses in advertising will be provided as soon as demanded.

## COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 3. | Soil Physics and Management.... | 3 | Jr. | Chem. 1 yr. |
| 4. | Soil Fertility and Fertilizers..... | 3 | Jr. | 3 |
| | *Advanced Courses* | | | |
| 102. | Soil Chemistry ................. | 5 | Sr. | 108 |
| 105-106. | Special Problems in Soils........ | † | Sr. | 102 |
| 107a,b. | Mechanical Analysis of Soils..... | 2 | Jr., sr. | 3 or parallel 3 |
| 108. | Chemical Analysis of Soils...... | 3 | Sr. | 4, Quant. Anal. |

† Credit according to the amount of work.

### INTRODUCTORY COURSES

3. Soil Physics and Management. Origin, mechanical composition, classification, and physical properties of soils; tillage operations in relation to moisture supply; micro-organisms of the soil. Lecture, laboratory, and field work. Alway, McMiller.

4. Soil Fertility and Fertilizers. Chemical composition of soils; farm manures; green manures; commercial fertilizers, composition and use; soil amendments; unproductive soils and their reclamation. Lecture and laboratory work. Alway, McMiller.

### ADVANCED COURSES

102. Soil Chemistry. A laboratory course on the chemical examination of soils including peat and alkali soils. A more advanced course than 108. .................

105-106. Special Problems in Soils. Individual laboratory or field work upon some special soil problem in soil physics or soil management. Arrangements must be made in advance. Alway.

107a,b. Mechanical Analysis of Soils. A laboratory course on the beaker, centrifuge, and elutriator methods of mechanical analysis. McMiller.

108. Chemical Analysis of Soils. A laboratory course on the quantitative determination of the most important soil constituents. ..........

## VETERINARY SCIENCE

### ANIMAL INDUSTRY GROUP

Professor Myron H. Reynolds; Assistant Professors Willard L. Boyd, Howard C. H. Kernkamp, Charles C. Palmer; Assistant Arthur L. Anderson.

## COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 4. | Livestock Breeding I | 2 | Jr. | 24 |
| 6. | Veterinary Medicine | 3 | Jr. | None |
| 12. | Common Diseases of Domestic Animals | 3 | Sr. | 24 |
| 14. | Hog Cholera | 1 | Jr., sr. | None |
| 24. | The Animal Body | 3 | Soph. | None |
| 27-28. | Physiology of Domestic Animals | 6 | Jr. | 24 |
| | *Advanced Courses* | | | |
| 122. | Advanced Anatomy of Locomotion and Conformation | 3 | Jr., sr. | 24 |

## INTRODUCTORY COURSES

4. Livestock Breeding I. Anatomy and physiology of reproduction. Embryology, heredity, and hygiene of breeding animals. Obstetrics, sterility and common diseases of breeding animals. Palmer.

6. Veterinary Medicine. Planned for students who can take only one semester of veterinary work. Includes preparatory work for the study of diseases, causes, prevention, diagnosis and treatment of the common diseases including lameness, unsoundness, and common medicines. Reynolds.

12. Common Diseases of Domestic Animals. Cause, diagnosis, prevention, and treatment of common diseases capable of easy diagnosis and either prevention or simple treatment. General principles of diagnosis, preparation and administration of common medicines. Boyd.

14. Hog Cholera. A detailed study of various phases of hog cholera and the use of serum. Lectures and laboratory work. Course intended especially for students specializing in Animal Husbandry and Agricultural Education. Kernkamp.

24. The Animal Body. Anatomy of the common farm animals including bones, muscles, and viscera. Lecture and demonstration. Palmer.

27-28. Physiology of Domestic Animals. A lecture and laboratory course in the physiology of the common farm animals. Special emphasis is given to digestion and metabolism. Palmer, Anderson.

## ADVANCED COURSES

122. Advanced Anatomy of Locomotion and Conformation. A laboratory course including the bones, articulations, muscles, and viscera involved in locomotion and conformation. Palmer.

## COURSES IN OTHER SCHOOLS AND COLLEGES

The following courses are offered to students in the College of Agriculture by departments of other schools and colleges of the University. For complete lists and descriptions of courses offered by these departments, see the bulletins of the several schools and colleges.

## ANIMAL BIOLOGY

### COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

Professors HENRY F. NACHTRIEB, THOMAS S. ROBERTS, CHARLES P. SIGERFOOS; Associate Professor HAL DOWNEY; Assistant Professors CHARLES W. HOWARD, ELMER LUND, OSCAR W. OESTLUND; Instructors GEORGE D. ALLEN, CHARLES E. JOHNSON, ADOLPH R. RINGOEN; Teaching Fellow ROYAL N. CHAPMAN.

*General statement.*—Courses in this Department are closely correlated with those offered by the Division of Economic Zoology of the College of Agriculture. For courses of that Division see page 44.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 3-4. | General Zoology | 6* | All | None |
| 7-8. | Histology and Embryology | 6* | Soph., jr., sr. | 3-4 |
| 15-16. | General Physiology | 6* | Soph., jr., sr. | 12 cred. incl. 3-4, Chem. 3 |
| 19-20. | Comparative Gross Anatomy of Vertebrates | 6* | Soph., jr., sr. | 3-4 |
| 23-24. | Entomology | 6* | Soph., jr., sr. | 3-4 |
| 26. | Medical Entomology | 3 | Jr., sr. | 3-4 or equivalent |
| 28. | Ornithology | 3 | Soph., jr., sr. | 3-4 |
| 51. | Protozoology | 3 | Jr., sr. | 9 cred. incl. 3-4 |
| | *Advanced Courses* | | | |
| 101-102. | Advanced Entomology | 6 | Jr., sr. | 23-24 or equivalent |
| 115-116. | Mammalogy | 6 | Jr., sr. | 3-4, and 19-20 or equivalent |
| 131-132. | Embryology | 6 | Jr., sr. | 7-8 |
| 143-144. | Genetics and Eugenics | 6 | Sr. | 7-8, 15-16 |

For additional courses see the bulletin of the College of Science, Literature, and the Arts.

* Both semesters must be completed before credit is given.

### INTRODUCTORY COURSES

3-4. GENERAL ZOOLOGY. A survey of the animal kingdom emphasizing the principles of development and structure in relation to functions and habit, heredity and evolution and the animals of economic importance. Lectures, quizzes, and laboratory. NACHTRIEB, ALLEN, RINGOEN.

7-8. HISTOLOGY AND EMBRYOLOGY. A comparative microscopic study of the origin and structure of the tissues of vertebrates and invertebrates, and of the organs of mammals. Textbook, lectures, and laboratory. DOWNEY.

15-16. GENERAL PHYSIOLOGY. Characteristic properties of living substance as shown by preparation and properties of typical biological compounds, colloids, enzyme action, growth, inanition, production of movements, heat, electricity, and light. Mechanisms and conditions of excitation and response. LUND.

19-20. COMPARATIVE GROSS ANATOMY OF VERTEBRATES. Lower vertebrates. Dissection and study of selected types, cyclostomes to reptiles or birds inclusive; special consideration of history of organ systems. Mammalian anatomy. An intensive study of the cat. Textbook, laboratory guide. Lectures, laboratory, quizzes. JOHNSON.

23-24. ENTOMOLOGY. Elements of entomology leading up to discussion of the principles of taxonomy and their application to the classification of insects. Textbook, lectures, quizzes, and laboratory work. OESTLUND.

26. MEDICAL ENTOMOLOGY. Study of insects and their near relatives which are disease-bearers or are parasites on man. Special emphasis is placed upon life-history habits, and methods of control. A course for students in medicine; elective to others. HOWARD.

28. ORNITHOLOGY. The study of the structure, classification and habits; special reference to birds of Minnesota. Considerable time devoted to field study. Bird or field-glasses and handbook required. Laboratory, lectures, quizzes. Class limited to 10. ROBERTS.

51. PROTOZOOLOGY. Lectures, reference and laboratory work on the structure and life-histories of Protozoa, with special reference to the relations of the Protozoa to diseases of animals. SIGERFOOS.

## ADVANCED COURSES

101-102. ADVANCED ENTOMOLOGY. Advanced work in the ecology and taxonomy of insects. Lectures, laboratory, and field work. OESTLUND.

115-116. MAMMALOGY. Structure and classification of North American mammals. The mammalian skeleton; its modifications, with consideration of our domestic animals; dissection of a typical mammal. Classification, natural history and geographic distribution with special reference to Minnesota mammals. JOHNSON.

131-132. EMBRYOLOGY. A brief survey of general embryology, and the organogeny of the vertebrates with special reference to the circulatory system. Conference, reference and laboratory work with Kellicott's *General Embryology* and *Outlines of Chordate Development* as text. NACHTRIEB.

143-144. GENETICS AND EUGENICS. Facts and theories of heredity and the application of the laws governing natural inheritances for the improvement of a race. Lectures, reference, conference, and laboratory work. Nachtrieb.

## BOTANY

### COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

Professors Frederic E. Clements, Carl Otto Rosendahl, Josephine E. Tilden; Assistant Professors Herbert F. Bergman, Frederick K. Butters, Ned L. Huff; Instructor William S. Cooper; Assistants Donald Folsom, Frances L. Long, Harvey Stallard.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1a,b. | General Botany | 3 | All | None |
| 2. | Structural Botany | 3 | All | 1 or 3 |
| 3a,b. | Evolution of Plants | 3 | All | 1 or equiv. |
| 4. | Field and Garden Botany | 3 | All | 1 or 3 |
| | *Intermediate Courses* | | | |
| 5-6. | Plant Morphology | 3 or 6 | Soph., jr., sr. | 6 cred.: see note under course |
| 7-8. | Taxonomy | 3 or 6 | Soph., jr., sr. | 6 cred.: see note under course |
| 9-10. | Physiology and Ecology | 3 or 6 | Soph., jr., sr. | 6 cred. |
| 11-12. | Industrial Botany | 3 or 6 | Soph., jr., sr. | 6 cred. incl. 2 or 3 |
| 13-14. | Mycology | 3 or 6 | Soph., jr., sr. | 6 cred. |
| | *Advanced Courses* | | | |
| 101-102. | Applied Ecology | 3 or 6 | Jr., sr. | 9 cred. |
| 103. | Foodstuffs and Textiles | 3 | Jr., sr. | 9 cred. |
| 111-112. | Advanced Taxonomy | 6 | Jr., sr. | 7-8 |
| 113-114. | Advanced Ecology | 6 | Jr., sr. | 9-10 |
| 115-116. | Advanced Physiology | 6 | Jr., sr. | 9-10 |
| 117-118. | Cytology | 6 | Jr., sr. | 18 cred. |
| 119-120. | Advanced Industrial Botany | 6 | Jr., sr. | 11-12 |
| 121-122. | Plant Studies and Methods | 6 | Jr., sr. | 12 cred. |

For additional courses see the bulletin of the College of Science, Literature, and the Arts.

### INTRODUCTORY COURSES

1a,b. General Botany. A study of the external form and organs of flowering plants, root, stem, leaf, fruit and seed, and of their relations to each other, together with simple greenhouse experiments to illustrate the various functions. Clements, Butters, Huff, Bergman, Cooper, Folsom, Long, Stallard.

2. Structural Botany. A study of the microscopic structure of flowering plants, the cell, tissues and tissue systems, as seen in the root, stem, leaf, etc. Butters, Huff, Stallard.

3a,b. Evolution of Plants. A comparative study of selected types of plants, illustrating the evolution of land plants from the simplest forms. Butters, Huff.

4. Field and Garden Botany. Greenhouse, garden, and field study of the form, behavior, naming, and relationships of flowering plants, together with individual problems in the pollination, reproduction and propagation of common flower types. Clements, Bergman, Cooper, Folsom, Long, Stallard.

## INTERMEDIATE COURSES

Either semester in the following courses open to students with the proper requisites:

5-6. Plant Morphology. A comparative study of the form, structure, and life history of typical algae, fungi, liverworts, mosses, ferns, and seed plants. Course 6 but not 5, open to those who have taken Course 3. Butters.

7-8. Taxonomy. General study of classification and relationships of flowering plants. Laboratory and field practice in determination of species, together with lectures and quizzes. Course 8 but not 7 open to those who have taken Course 4. Rosendahl.

9-10. Physiology and Ecology. Greenhouse and field study of physical factors and plant responses, absorption, transport, water loss, nutrition, growth, fertilization, reproduction, and adaptation; field study of habitat, migration, competition, invasion, and succession. Clements, Cooper.

11-12. Industrial Botany. Laboratory study of the plants which are useful to man, including those which furnish food, shelter, fuel, clothing, etc. Tilden.

13-14. Mycology. The classification and life history of the various groups of fungi, based on identification, field work, and cultures. Clements, Bergman.

## ADVANCED COURSES

101-102. Applied Ecology. A study of the physiological processes and the ecological principles and methods involved in the production of field, garden and forest crops. Either semester open to students who have had introductory botany, physiology, and ecology. Clements.

103. Plant Foodstuffs and Textiles. A special study of the botany of foods, texile fibers and fabrics, together with an inquiry into the relation of plants to household processes and problems. For young women. Tilden.

111-112. Advanced Taxonomy. An advanced course in which special attention is given to the taxonomy of difficult natural groups, involving systematic principles and practice, rules of nomenclature, systems of classification, etc. Laboratory, field work, lectures, and quizzes. Rosendahl.

113-114. Advanced Ecology. A critical study of plant habitats by means of instruments and the adaptations produced by water and by light, together with careful examination of the causes and reactions of plant formations. Clements, Cooper.

115-116. Advanced Plant Physiology. A study of the relations of factor, function, and structure in the various organs of plants, with special reference to absorption, transpiration, photosynthesis, respiration, irritability, and reproduction. Class discussions and quizzes, greenhouse and field work. Clements, Bergman.

117-118. Cytology. A survey of cell structure and the various phenomena of division, fusion, and metamorphosis, together with a review of the history of cytological investigation. Methods of cytological research indicated in the laboratory. Rosendahl.

119-120. Advanced Industrial Botany. A study of the origin, distribution and cultivation of plants yielding products of economic value, the nature and uses of these products and the processes by which they are obtained from the plants. Tilden.

121-122. Plant Studies and Methods. Nature study and high-school botany presented as they are to be taught; the material is taken up in detail in proper sequence. Training in method is afforded by practice in the University High School. Clements.

## CHEMISTRY

### SCHOOL OF ANALYTICAL AND APPLIED CHEMISTRY

Professors George B. Frankforter, Charles F. Sidener; Assistant Professor Ira H. Derby; Instructors Ross A. Baker, Isaac W. Geiger, Carl L. Schumann, Woldemar M. Sternberg, H. Lee Ward.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 3a-4b, 3b-4a. | Adv. General Chem. and Qualitative Analysis | 6* | Fr., soph., jr. | Entrance cred. in Chem. |
| 11-12. | Quantitative Analysis | 8* | Soph., jr., sr. | 3-4 or 7-8 |
| 33. | General Chem. and Qualitative Analysis | 5† | Fr., soph., jr. | None |
| 35-36. | Organic Chemistry | 8* | Soph., jr., sr. | 3-4 or 7-8 |

*Advanced Courses*

| | | | |
|---|---|---|---|
| 121-122. Physical Chemistry ........ | 4* | Jr., sr. | 36, Phys. 2 and 4 |
| 123-124. Physico-Chemical Laboratory.. | 2* | Jr., sr. | See statement |

For additional courses see the bulletin of the School of Chemistry.

* Both semesters must be completed before credit is given for the first semester.
† Course 4b must be completed before credit is given.

### INTRODUCTORY COURSES

3a-4b, 3b-4a. Advanced General Chemistry and Qualitative Analysis. Lectures, recitations, and laboratory work. General descriptive chemistry, including the fundamental theories and laws, and qualitative analysis. Frankforter, Baker, Ward.

11-12. Quantitative Analysis. General discussion of quantitative methods, with laboratory work in gravimetric analysis, first semester, followed by a discussion of standard solutions and the necessary stoichiometric calculations, with laboratory work in volumetric analysis, second semester. Sidener, Sternberg, Geiger.

33. General Chemistry and Qualitative Analysis. Designed for those who have had no high school chemistry; in preparation for Course 4b. See statement under 3a-4b. Frankforter, Baker.

35-36. Organic Chemistry. This course includes the aliphatic and the aromatic series with the preparation of the more important compounds. Frankforter, Schumann.

### ADVANCED COURSES

121-122. Physical Chemistry. A consideration of the theories and laws, phenomena and processes which form the basis of chemical science. Charts, models, and experiments are employed to supplement and illustrate the discussions. Derby.

123-124. Physico-chemical Laboratory Practice. Open only to students pursuing Course 121-122 or who have had it or its equivalent. Physico-chemical methods and measurements. Derby.

## ECONOMICS

### COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

Professors John H. Gray, E. Dana Durand; Assistant Professors Roy G. Blakey, J. Franklin Ebersole, Thomas W. Mitchell; Instructors Lloyd M. Crosgrave, William W. Cumberland, Albert C. Hodge, Albert C. James, Robert J. McFall; Assistant Frank Robotka.

## COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| †2a,b. | Indust. and Commerce of U. S. . . | 3 | All | None |
| †3a,b. | Principles of Economics. . . . . . . . . | 3 | Soph., jr., sr. | 2 |
| 4a,b. | Economic Problems . . . . . . . . . . . . | 3 | Soph., jr., sr. | 3 |
| 9. | Indust. Hist. since 1750. . . . . . . . . | 3 | Soph., jr., sr. | 3 |
| 13. | Econ. Geog. of For. Countries. . . | 3 | Soph., jr., sr. | 2 |
| †18. | Problems in Agricultural Econ. . . . | 3 | Soph., jr., sr. | 3 |
| †19. | Marketing of Farm Products. . . . . | 3 | Jr., sr. | 3 |
| 34. | Business Management . . . . . . . . . . | 3 | Soph., jr., sr. | 3 |
| 35-36. | Accounting Principles . . . . . . . . . . | 6* | Soph., jr., sr. | None |
| 37. | Marketing of Products. . . . . . . . . . . | 3 | Jr., sr. | 3 |
| 43a,b. | Banking . . . . . . . . . . . . . . . . . . . . . . | 3 | Soph., jr., sr. | 3 |
| 46. | Property Insurance . . . . . . . . . . . . | 3 | Soph., jr., sr. | 3 |
| | *Advanced Courses* | | | |
| 101. | Statistics . . . . . . . . . . . . . . . . . . . . . . | 3 | Jr., sr. | 6 cred. incl. 3 |
| 135. | Accounting for Marketing Enterprises . . . . . . . . . . . . . . . . . . . . . . . . | 3 | Jr., sr. | 19 |
| 141. | Money and Prices. . . . . . . . . . . . . . . | 3 | Jr., sr. | 3 and 43 |
| 145. | The Modern Business Corporation | 3 | Jr., sr. | 6 cred. incl. 3 |
| 161. | Labor Problems . . . . . . . . . . . . . . . . | 3 | Jr., sr. | 3 and 4 |
| 164. | Econ. Functions of the State. . . . . | 3 | Jr., sr. | 6 cred. incl. 3 |
| 173. | Econ. of Transportation. . . . . . . . . | 3 | Jr., sr. | 6 cred. incl. 3 |
| 191. | Public Finance . . . . . . . . . . . . . . . . . | 3 | Jr., sr. | 6 cred. incl. 3 |
| 192. | State and Local Taxation. . . . . . . . | 3 | Jr., sr. | 191 |
| 251-252. | Sem. in Agric. Economics. . . . . . . . | 6* | Sr. | 18, 19 |

For additional courses see the bulletin of the College of Science, Literature, and the Arts.

* Both semesters must be completed before credit is given for the first semester.

† Given at University Farm.

## INTRODUCTORY COURSES

2a,b. Industries and Commerce of the United States. Agricultural, mining, manufacturing industries and commerce. Characteristics of the several sections of the country. Leading individual industries: geographical distribution, methods of organization, production, and marketing, and relationships to one another. McFall.

3a,b. Principles of Economics. Fundamentals of economic theory with special reference to agriculture. Cumberland.

4a,b. Economic Problems. A survey of the fundamentals in the problems of labor, social insurance, socialism, government ownership, corporations, trusts, monopolies, transportation, banking, protection, free trade, public revenues and expenditures. Blakey.

9. Industrial History Since 1750. Economic effects of inventions, wars, political changes, increased supply of precious metals, improved transportation, and modifications of business organization in chief European countries and the United States. Gray.

13. Economic Geography of Foreign Countries. Economic basis of modern civilization; localization of industries; trade routes, principal extractive, manufacturing and distributive industries of leading foreign countries, especially markets for American trade. Special emphasis will be laid on South America. McFall.

18. Problems in Agricultural Economics. The practical economic problems which confront the farmer as a producer, consumer, and citizen; land settlement; size of farms; intensity of cultivation; tenancy; credit; marketing; coöperation; taxation; protective duties; foreign markets; money and prices; transportation. Durand.

19. Marketing of Farm Products. The organization and methods of marketing; the functions of middlemen; the costs of marketing various products; coöperative marketing. Durand.

34. Business Management. The principles of efficiency in business operation and forms of organization to apply them; the typical departments of a business; their functions, office organization and administration. Textbook, assigned readings, and lectures. Mitchell, Hodge.

35-36. Principles of Accounting. Purposes of accounts and principles of account classification; capital and revenue; accruals; principles of valuation; depreciation; preparation and interpretation of balance sheets, income accounts, and other business statements; corporation accounts. Laboratory course with supplementary lectures. Mitchell, Hodge.

37. Marketing of Products. Merchandising problems of manufacturers, wholesalers, and retailers; distributing system and market organization; price policies. James.

43a,b. Principles and Practice of Banking. Contemporary banking institutions, both national and state; their incorporation, organization, administration; reserves, note issues, clearing houses, domestic and foreign exchange; the banking systems of foreign countries; and the Federal Reserve Banks of the United States. Ebersole.

46. Property Insurance. Basic theory and critical examination of policy contracts of fire, marine, other casualty, title, and credit insurance. James.

## ADVANCED COURSES

101. Theory and Practice of Statistics. Principles of collection, tabulation, and interpretation of statistical material, illustrated by present-day statistical data. Lectures, assigned readings, and special investigations by individual members of the class. Durand.

135. Accounting for Marketing Enterprises. Principles of business practice and accounting for coöperative and other establishments and

organizations engaged in marketing of farm products, such as elevators, creameries, livestock shipping concerns, etc. Text book, lectures, and practice work. Robotka.

141. Money and Prices. The functions of money; the nature and effects of credit; changes in prices as shown by index numbers; international movements of gold; monetary standards and currency systems; the problem of securing an ideal money. Ebersole.

145. The Modern Business Corporation. The organizing, financing, and managing of corporations; the position of the corporation before the law; methods of accounting; the relation of the government to the corporation; the question of trusts in its various phases. Gray.

161. Labor Problems. Modern labor problems; woman and child labor, industrial education, unemployment, poverty, industrial hygiene, welfare work, profit sharing, coöperation, labor unions, strikes, boycotts, conciliation and arbitration; economic causes and effects of immigration. Crosgrave.

164. The Economic Functions of the State. The proper limits of state interference with private property, freedom of contract and individual liberty. Police powers of the state. Legislation concerning factories, female and child labor, minimum wage, social insurance, etc. Crosgrave.

173. Economics of Transportation. Survey of railways and railway policy of the United States and representative foreign countries; canal and ocean transportation; railway organization and finance; railway discriminations, competition, pooling and combination; the railways and labor. McFall.

191. Public Finance. Public expenditures; public debt; budgetary legislation; tax systems. Blakey.

192. State and Local Taxation. Problems of state and local taxation. Historic survey of various taxes and examination of present procedure in taxing different kinds of property; tax reforms. Particular attention given to conditions in Minnesota. Blakey.

251-252. Seminar in Agricultural Economics. Research problems in the marketing and distribution of farm products, agricultural credit, farm ownership and tenancy, and agricultural organizations. Durand.

## FORESTRY

### COLLEGE OF FORESTRY

Professor Edward G. Cheyney; Associate Professor John P. Wentling.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1. | General Forestry | 3 | All | None |
| 21. | Farm Forestry | 3 | Jr. | None |

For additional courses see the bulletin of the College of Forestry.

### INTRODUCTORY COURSES

1. GENERAL FORESTRY. A brief history of the development of forestry in Europe and America; description of the United States forests. Lectures and collateral reading. CHEYNEY.

21. FARM FORESTRY. A study of the establishment, care, maintenance, and utilization of the farm woodlot and windbreaks. A sketch of the forestry work in Minnesota and the United States. CHEYNEY, WENTLING.

## GEOLOGY AND MINERALOGY

### COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

Professor WILLIAM H. EMMONS; Assistant Professors FRANK F. GROUT, CHESSLEY J. POSEY; Instructors A. WALFRED JOHNSTON, TERENCE T. QUIRKE.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1. | General Geology | 3 | Soph., jr., sr. | None |
| 3. | Laboratory Work | 1 | Soph., jr., sr. | Supports 1 |
| 4. | Geology of Minnesota | 3 | Soph., jr., sr. | 1 |
| 5. | Economic Geology | 3 | Soph., jr., sr. | 1 |
| 21. | Elements of Mineralogy | 3 | Soph., jr., sr. | See statement |
| 29. | General Physiography | 3 | Soph., jr., sr. | None |
| 35. | Laboratory Work | 1 | Soph., jr., sr. | Supports 29 |

For additional courses see the bulletin of the College of Science, Literature, and the Arts.

### INTRODUCTORY COURSES

1. GENERAL GEOLOGY. A synoptical treatment of materials of the earth and of geologic processes. Physiographic, dynamic and structural geology, with a brief introduction to historical geology. Lectures, laboratory work, field excursions, map study, and conferences. EMMONS, JOHNSTON.

3. LABORATORY WORK. Open only to students taking Course 1. Supplements Course 1 with study of rocks and ores, topographic and geologic maps and reference reading. JOHNSTON.

4. Geology of Minnesota. The physical geography and geologic history of Minnesota. The relations of industrial development to geological features. The principles of pre-Cambrian geology as exemplified in Minnesota. Johnston.

5. Economic Geology. The mineral resources of the United States. The origin, occurrence, distribution, and uses of the more important minerals and mineral fuels of economic value. Lectures, map work, conferences, and field excursions. Quirke.

21. Elements of Mineralogy. Open to students taking Chemistry. The crystal systems; morphological, physical, and chemical character of minerals; occurrence, genesis, and uses of minerals; classification and description of common minerals. Determinative work in laboratory, blowpipe analysis, sight identification. Grout.

29. General Physiography. Principles of earth sculpture; physiographic changes in progress, and agencies causing them; hydrography and oceanography; planetary relations; climatology; field excursions. Posey.

35. Laboratory Work. A course in the interpretation of topographic maps. Supplements and should accompany Course 29, tho not required in connection with it. Should be taken by those who expect to teach Physiography. Posey.

## GERMAN

### COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

Professor Carl Schlenker; Assistant Professors Oscar C. Burkhard, Samuel Kroesch, Walter R. Myers; Instructors James Davies, Lynwood G. Downs, J. Theodore Geissendorfer, Alfred E. Koenig, Harold W. Soule, Richard Wischkaemper, Edwin H. Zeydel; Teaching Fellows Louise G. Frary, Arnold W. Shutter.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1a,b. | Beginning | 6 | All | None |
| 3a,b. | Intermediate | 6 | All | 1 |
| 5-6. | Prose and Poetry | *6 | All | 2 yrs. preparatory |
| 7-8. | Drama | *6 | All | 5-6 or 4 yrs. preparatory |
| 11-12. | Rapid Reading | *6 | All | 3 |
| 21-22. | Scientific Intermediate | *6 | All | 1, or 2 yrs. preparatory |
| 23-24. | Scientific Advanced | *6 | All | 22, 5-6 or 4 yrs. preparatory |

For additional courses see the bulletin of the College of Science, Literature, and the Arts.

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* Both semesters must be completed before credit is given for the first semester.

### INTRODUCTORY COURSES

1a,b. Beginning. Double course given each semester as a six-hour course. Pronunciation, grammar, conversation, and composition; selected reading in easy prose and verse. Kroesch, Myers, Davies, Downs, Graves, Koenig, Soule, Zeydel, Shutter.

2a,b. Intermediate. Double course given each semester as six-hour course. Selected texts in modern narrative and descriptive prose; selected lyrics and ballads; a drama of Lessing, Goethe, or Schiller. Assigned readings of texts outside of class. Kroesch, Myers, Davies, Downs, Graves, Koenig, Soule, Zeydel, Shutter.

5-6. Prose and Poetry. Geography, history, and legend. Review of German grammar throughout the year. Burkhard, Downs, Geissendoerfer, Graves, Wischkaemper, Frary.

7-8. Drama. First semester: classic drama; plays of Lessing, Goethe, Schiller. Second semester: modern drama; plays of Hebbel, Sudermann, Hauptmann and others. Assigned readings and reports throughout the year. Schlenker, Burkhard, Kroesch, Davies.

11-12. Rapid Reading. First semester: narrative prose; Hauff, Storm, Sudermann, Goethe's *Hermann and Dorothea*. Second semester: plays of Lessing, Goethe, Schiller, Hebbel. Assigned readings and reports. Davies, Graves, Koenig, Soule.

21-22. Scientific Intermediate. This course aims to give students a reading knowledge of German for use in scientific studies. Not open to those who have obtained credit for either Course 3-4 or 5-6. Geissendoerfer, Graves, Wischkaemper.

23-24. Scientific Advanced. Reading of monographs and periodicals. Not open to those who have obtained credit for Course 7-8. Wischkaemper.

## PATHOLOGY, BACTERIOLOGY, AND PUBLIC HEALTH

### MEDICAL SCHOOL

Professor Harold E. Robertson; Associate Professor Winford P. Larson; Instructors Harold S. Diehl, Arthur T. Henrici, Percy A. Ward, Kano Ikeda.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Course* | | | |
| 6a,b. | Elementary Bacteriology | 3 | Soph. | None |

For additional courses see the bulletin of the Medical School.

### INTRODUCTORY COURSE

6a,b. Elementary Bacteriology. Lecture and laboratory course. The principles and technique of general bacteriology. Studies in the morphologic and biologic characters of the common bacteria. Preparation of culture media. Disinfectants and disinfection. Bacteriology of water and food products. Larson, Henrici, Diehl, Ward, Ikeda.

## PHYSICS

### COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

Professors Henry A. Erikson, Anthony Zeleny; Assistant Professor Louis W. McKeehan; Instructors Ernest O. Dieterich, Paul E. Klopsteg.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1. | General Physics | 3 | Soph., jr., sr. | Agr. Eng. 1, 2, or parallel Agr. Eng. 1 or 2 |
| 2. | General Physics | 3 | Soph., jr., sr. | 1 |
| 3. | General Laboratory Practice | 1 | Soph., jr., sr. | See statement |
| 4. | General Laboratory Practice | 1 | Soph., jr., sr. | See statement |
| 5-6. | General Physics (Col. of Agr.) | 6* | Soph., jr., sr. | None |

For additional courses see the bulletin of the College of Science, Literature, and the Arts.

* Both semesters must be completed before credit is given.

### INTRODUCTORY COURSES

1. General Physics. Mechanics of solids and fluids, sound, heat. Treatment experimental rather than mathematical; the fundamental principles. First part of a general course 1-2. Should be taken in conjunction with Course 3. Zeleny, Klopsteg, Dieterich.

2. General Physics. Light, electricity, magnetism. Treatment experimental; fundamental principles, including radioactivity, ionization, X-radiation, and electrical constitution of matter. Second part of general course 1-2. Should be taken in conjunction with Course 4. Zeleny, Klopsteg, Dieterich.

3. General Laboratory Practice. Physical measurements in the mechanics of solids, fluids, sound, heat, giving students knowledge of

experimental methods, and acquaintance with the fundamental facts. Open to all who have completed or are taking Course 1. McKEEHAN, DIETERICH.

4. GENERAL LABORATORY PRACTICE. Physical measurements in light, electricity, and magnetism. Open to all who have completed or are taking Course 2, and have completed Course 3. McKEEHAN, DIETERICH.

5-6. GENERAL PHYSICS. Mechanics of solids and fluids, sound, heat, light, electricity, and magnetism. Treatment experimental; the fundamental principles. Open to students registered in the College of Agriculture. ZELENY, KLOPSTEG, DIETERICH.

## POLITICAL SCIENCE

### COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

Professors WILLIAM A. SCHAPER, JEREMIAH S. YOUNG.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1a,b. | American Government | 3 | Soph., jr., sr. | None |
| 5. | European Municipal Administration | 3 | Soph., jr., sr. | None |
| 6. | American Municipal Administration | 3 | Soph., jr., sr. | 1 |
| 7a,b. | State and Local Government | 3 | Soph., jr., sr. | 1 |
| *28. | Business Law | 3 | Jr., sr. | 1 or Econ. 6 cred. |
| 51. | Business Law, Part I | 3 | Jr., sr. | 1 or Econ. 6 cred. |
| 52. | Business Law, Part II | 3 | Jr., sr. | 51 |

For additional courses see the bulletin of the College of Science, Literature, and the Arts.

* Given at the University Farm.

### INTRODUCTORY COURSES

1a,b. AMERICAN GOVERNMENT. Organization and actual workings of the national government; nature and origin of the American governmental system. SCHAPER, YOUNG.

5. EUROPEAN MUNICIPAL ADMINISTRATION. A study of French, German, Austrian, and English cities; the forms of government, parties, and elections; achievements in finance, police, sanitation, city planning and other public services undertaken. SCHAPER.

6. AMERICAN MUNICIPAL ADMINISTRATION. A study of the organization and chief functions of American cities; their growth, relation to the state, forms of charters, inefficiency, and corruption, reform measures; and the administration of finance, police, health and other activities. SCHAPER.

7a,b. STATE AND LOCAL GOVERNMENT. Comparison of American state governments, especially Minnesota; relation of states to the United States and to local units of government; recent experiments such as initiative and referendum, the recall and primaries; social and economic legislation. Young.

28. Business Law. A course in Business Law (arranged for students in Agriculture) including contracts, agency, mortgages, conveyances, and negotiable instruments. ..............

51. Business Law, Part I. The principles of law governing ordinary business transactions, including the general law of contracts, sales, mortgages, bankruptcy, and agency. Young.

52. Business Law, Part II. The law of partnerships, corporations, and negotiable instruments. Young.

## ROMANCE LANGUAGES

### COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

Professors Everett Ward Olmsted, Colbert Searles; Assistant Professors Jules T. Frelin, Ruth S. Phelps; Professorial Lecturers Balbino Dávalos, Pedro Henríquez Ureña, Paul H. Morin; Instructors Harry E. Atwood, George S. Barnum, Francis H. Barton, Nelson F. Coburn, Willis J. Plummer, Edward H. Sirich.

### COURSES

| No. | Title | Credits | Offered to | Prereq. courses |
|---|---|---|---|---|
| | *Introductory Courses* | | | |
| 1a,b. | Beginning French ................ | 6 | All | None |
| 2a. | Beginning French ................. | 3 | All | Prep. French 1 yr. |
| 3a,b. | Intermediate French .............. | 6 | All | **1 or equiv.** |
| 4. | Survey of French Literature....... | 6 | All | 1 or equiv. |
| 5-6. | Survey of French Literature........ | 6 | All | 3 or equiv. |
| 7-8. | Elemen. French Conversation...... | 2 | All | 3 or equiv. |
| 9-10. | Elemen. French Composition....... | 1 | All | 3 or equiv. |
| 31a,b. | Beginning Spanish ................ | 6 | All | None |
| 33-34. | Beginning Spanish ................ | 6 | All | None |
| 35a,b. | Intermediate Spanish ............ | 6 | All | 31 or equiv. |
| 37-38. | Intermediate Spanish ............ | 6 | All | 31 or equiv. |
| 39-40. | Spanish Literature of the Nineteenth Century ................. | 6 | All | 35 or equiv. |
| 41-42. | Elementary Spanish Conversation.. | 2 | All | 35 or equiv. |
| 43-44. | Elementary Spanish Composition.... | 2 | All | 35 or equiv. |

For additional courses see the bulletin of the College of Science, Literature, and the Arts.

### INTRODUCTORY COURSES

1a,b. Beginning French. Double course. This course will complete in one semester the work heretofore done in two. Pronunciation, grammar, drill, oral exercises and translation. Searles, Frelin, Atwood, Barnum, Barton, Coburn, Sirich.

2a. BEGINNING FRENCH. For those who have completed one year of preparatory French. BARTON.

3a,b. INTERMEDIATE FRENCH. Double course. This course will complete in one semester the work heretofore done in two. Review of grammar, composition, conversation, and reading, representative authors of the Nineteenth Century. FRELIN, ATWOOD, BARNUM.

4. SURVEY OF FRENCH LITERATURE. Double course. Same as 5-6. BARTON.

5-6. GENERAL SURVEY OF FRENCH LITERATURE. Lectures, recitations, and assigned readings. Designed to cover the whole period in historical outline, and to prepare for a more minute study of special periods. Selections from representative authors. PHELPS, ATWOOD, SIRICH.

7-8. ELEMENTARY FRENCH CONVERSATION. Small amount of outside preparation will be required. The section meeting at nine o'clock on Monday, Wednesday, and Friday is limited to students taking Course 5-6 and is based on the work of that course. FRELIN, BARTON, SIRICH.

9-10. ELEMENTARY FRENCH COMPOSITION. FRELIN, BARTON.

31a,b. BEGINNING SPANISH. Double course. This course will complete in one semester the work heretofore done in two. Pronunciation, grammar drill, oral exercises, and translation. HENRÍQUEZ, PLUMMER, BARNUM.

33-34. BEGINNING SPANISH. This course is the same as Course 31 except that it is a year-course. OLMSTED, COBURN, PLUMMER.

35a,b. INTERMEDIATE SPANISH. Double course. This course will complete in one semester the work heretofore done in two. Review of grammar, composition, conversation, and readings. HENRÍQUEZ, PLUMMER.

37-38. INTERMEDIATE SPANISH. This course is the same as course 35a,b, except that it is a year-course. HENRÍQUEZ, COBURN.

39-40. SPANISH LITERATURE OF THE NINETEENTH CENTURY. Lectures, recitations, and assigned readings. HENRÍQUEZ.

41-42. ELEMENTARY SPANISH CONVERSATION. A small amount of outside preparation required. The life and customs of modern Spain; accompanied by illustrative material. PLUMMER.

43-44. ELEMENTARY SPANISH COMPOSITION. Special attention given to social and commercial correspondence. PLUMMER.

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